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Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography*.

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19970019375 Mission Research Corp., Newington, VA USA

Use of Short Time Series for Early Global Warming Trend Detection for Ocean Acoustic Travel Times

McCartor, Gary D., Southern Methodist Univ., USA; Wortman, William R., Mission Research Corp., USA; Bottone, Steven, Mission Research Corp., USA; Sep. 28, 1996; 22p; In English

Contract(s)/Grant(s): MDA972-93-C-0021

Report No.(s): AD-A317849; MRC/WDC-R-389; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Previous work indicated that for expected variability of ocean acoustic propagation times and the level of anticipated warming trends, it may take at least two decades of observation to establish, with an adequate level of confidence, that warming does or does not exist. In the current report, we have attempted to establish the extent to which the use of data from a shorter period may allow at least better definition of the period needed to establish these warming trends. Truncated simulated data sets, generally 5 or 10 years, from the MASIG model of acoustic propagation time variability over decades have been used to establish the extent to which the statistical trend extraction techniques give stable results using these shorter series to define the noise background. It is found that the use of these shorter series provides an apparent reduction of time required to detect trends; This unfortunately indicates that meaningful estimates of warming trends cannot be made with use of a lengthy data set approaching the full 20 year interval. Generally it is found that once the length of the background data is less than half of the full set, the estimates of times needed to detect trends are, falsely, reduced. This indicates that the variability which tends to mask trends is long period and that shorter observation intervals do not allow characterization of this variability. In another portion of this study, we find that the substantial short term variability seen in the first six months of the ATOC experiment is comparable with that seen by Spiesberger but that this variability plays almost no role for the long term trend detection problem, which is dominated by multiyear periods.

DTIC

Global Warming; Statistical Analysis; Time Series Analysis; Acoustic Propagation; Oceans; Underwater Acoustics; Oceanography

19970019722 Empresa Nacional de Residuos Radiactivos S.A., Brazil

Geostatistical methods for the integrated information *Metodos geoestadisticos para la integracion de informacion*

Cassiraga, E.F., Universidad Politecnica de Valencia, Spain; Gomez-Hernandez, J.J., Universidad Politecnica de Valencia, Spain; 1996; 90p; In Spanish

Report No.(s): ENRESA-04/96; DE97-703867; ENRESA-4-96; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

The main objective of this report is to describe the different geostatistical techniques to use the geophysical and hydrological parameters. We analyze the characteristics of estimation methods used in others studies.

DOE

Geophysics; Algorithms; Data Processing

19970020306 Hawaii Univ., Honolulu School of Ocean and Earth Science and Technology, Honolulu, HI USA

Evolution of Porosity and Seismic Properties of Shallow Oceanic Crust *Final Report, 1 Feb. 1990 - 31 May 1996*

Fryer, Gerard J., Hawaii Univ., USA; Karsten, Jill L., Hawaii Univ., USA; Wilkens, Roy H., Hawaii Univ., USA; Nov. 1996; 5p; In English

Contract(s)/Grant(s): N00014-90-J-1625

Report No.(s): AD-A319149; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

The uppermost oceanic crust undergoes substantial changes in physical properties as it is transported away from a mid-ocean ridge. Porosity must play a central role in dictating such changes. This study sought to use seismic measurements to infer porosities and so to gain an understanding of crustal aging. Techniques used were development of the theory linking porosity to seismic velocity, microscope investigation of seafloor lavas, measurement of ultrasonic velocities in the laboratory, comparisons of theory with field measurements of seismic velocity, and field investigations of seafloor extrusives exposed on land. The project demonstrated that seismic velocities in the seafloor are strongly dependent on pore shape. Those velocities, and the nature of their increases with age and depth, were shown to be completely consistent with the concept of progressive sealing of cracks by alteration products. The project also showed how seismic measurements can be interpreted in terms of overall porosity and the distribution of that porosity over different pore shapes. Together with other ONR-supported crustal aging studies, the project confirmed the

idea that the evolution of the oceanic crust is governed by its circulating fluids, making permeability, and hence porosity, key factors in controlling the state of the crust.

DTIC

Ocean Bottom; Velocity Measurement; Acoustic Velocity; Seismology; Earth Crust; Mid-Ocean Ridges; Crustal Fractures

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19970019303 Los Alamos National Lab., NM USA

A measurement concept for hot-spot BRDFs from space

Gerstl, S.A.W., Los Alamos National Lab., USA; [1996]; 9p; In English; Multiangular Remote Sensing: Measurements, Models, and Applications, Sep. 1996, Beijing, China

Contract(s)/Grant(s): W-7405-ENG-36

Report No.(s): LA-UR-96-2797; CONF-9609240-1; DE96-014621; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

Several concepts for canopy hot-spot measurements from space have been investigated. The most promising involves active illumination and bistatic detection that would allow hot-spot angular distribution (BRDF) measurements from space in a search-light mode. The concept includes a pointable illumination source, such as a laser operating at an atmospheric window wavelength, coupled with a number of high spatial-resolution detectors that are clustered around the illumination source in space, receiving photons nearly coaxial with the retro-reflection direction. Microwave control and command among the satellite cluster would allow orienting the direction of the laser beam as well as the focusing detectors simultaneously so that the coupled system can function like a search light with almost unlimited pointing capabilities. The concept is called the Hot-Spot Search-Light (HSSL) satellite. A nominal satellite altitude of 600 km will allow hot-spot BRDF measurements out to about 18 degrees phase angle. The distributed are taking radiometric measurements of the intensity wings of the hot-spot angular distribution without the need for complex imaging detectors. The system can be operated at night for increased signal-to-noise ratio. This way the hot-spot angular signatures can be quantified and parameterized in sufficient detail to extract the biophysical information content of plant architectures.

DOE

Remote Sensing; Imaging Techniques; Bistatic Reflectivity; Laser Beams; Microwaves; Radiometers; Signal Detection; Canopies (Vegetation)

19970019322 Army Topographic Engineering Center, Alexandria, VA USA

An Assessment of the Horizontal Accuracy of Interim Terrain Data, Jun. 1994 - Oct. 1995

Fatale, Louis, Army Topographic Engineering Center, USA; Messmore, Jeffrey, Army Topographic Engineering Center, USA; Ackeret, James, Army Topographic Engineering Center, USA; Apr. 1996; 33p; In English

Report No.(s): AD-A317349; TEC-0081; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Within the U.S. Army and throughout the private sector, the accuracy of Digital Topographic Data (DTD) is often taken for granted. Users assume terrain data to be accurate merely because of its digital nature. This report describes a study that was undertaken to determine the horizontal accuracy of Interim Terrain Data (ITD), a 1:50,000-scale terrain analysis data base. ITD is composed of vector features and associated attributes representing land cover characteristics. It is produced by the Defense Mapping Agency (DMA) and provided to the U.S. Army to support near-term requirements on an interim basis until more standardized data is available. Because of its interim nature, ITD may be digitized from hard copy source ('carto-controlled') or produced solely from photography ('photo-controlled'). No definitive accuracy statement is provided with the data. This study was initiated in 1994 with the collection of ground coordinates for over 400 selected ITD features. Each feature was located in the field using a Precise Lightweight Global Positioning System Receiver (PLGR) in the Precise Positioning Service (PPS) mode (10-meter horizontal accuracy). Universal Transverse Mercator (UTM) coordinates obtained from the PLGR were annotated for each feature.

DTIC

Topography; Global Positioning System; Geographic Information Systems; Digital Data

19970019343 Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Data Fusion Urban Cartography

Vergara, Oscar Ricardo, Instituto Nacional de Pesquisas Espaciais, Brazil; Candeias, Ana Lucia Bezerra, Instituto Nacional de

Pesaciais Espaciais, Brazil; deLourdesNdeOKurkdjian, Maria, Instituto Nacional de Pesaciais Espaciais, Brazil; 1996; 6p; In English; 18th; ISPRS, 9-19 Jul. 1996, Vienna, Austria

Report No.(s): INPE-6128-PRE/229; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

The set of images of the various operating orbital sensors is not enough to meet all the needs of the users, as there are applications which require high spatial and spectral resolutions. For this reason, aiming at overcoming some original data restrictions, image processing is used to generate improved quality products. Data fusion is the generic name given to techniques which allow to integrate images of different spatial and spectral characteristics in order to obtain synthetic images which have the advantages presented by their components, making the extraction of information easier. In this paper, the processing applied to the original data (panchromatic and multispectral HRV-SPOT images) made the photointerpretation easier as well as the mapping of intra-urban areas, within a methodology of cartographic updating at 1:50,000 scale. Such processing started by applying a high-pass filter to the panchromatic image, to enhance edges. Later the IHS transformation was used, following a methodology which intended to generate a synthetic product preserving the spectral characteristics of the multispectral component, without losing the spatial resolution of the filtered panchromatic image. The results obtained through this processing show that in the synthetic image, the intra-urban areas were considerably improved.

Author

Data Processing; Image Processing; Remote Sensing; Photointerpretation; Multisensor Fusion

19970019551 Massachusetts Univ., Dept. of Computer Science, Amherst, MA USA

The UMass RADIUS Project: Year 2 Annual Report, Oct. 1993 - Oct. 1994

Collins, Robert, Massachusetts Univ., USA; Hanson, Allen, Massachusetts Univ., USA; Riseman, Edward, Massachusetts Univ., USA; Oct. 1996; 39p; In English

Contract(s)/Grant(s): DACA76-92-C-0041

Report No.(s): AD-A317240; TEC-0082; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

A set of Image Understanding (IU) algorithms for automated site model acquisition and extension are being developed at the University of Massachusetts. In 1995, a building extraction system was implemented to acquire flat roofed, rectilinear building models from multiple, monocular images. This system hypothesizes building rooftops from a single image, then searches for supporting evidence in other views and determines the precise 3-D shape and location of each building via multi-image triangulation. Projective mapping of image intensity information onto these polyedral building models results in a realistic site model that can be rendered using virtual 'fly-through' graphics. To perform model extension, a prior site model is registered to new images, and building model acquisition procedures are focused on previously unmodeled areas. In an operational scenario, this process would be repeated as new images become available, gradually accumulating evidence over time to make the site model data base more complete and accurate. Model-to-image registration techniques also are presented that can be used to automatically determine model-based local corrections to the resected camera parameters provided with each image.

DTIC

Image Processing; Optical Activity; Detection

19970019599 Instituto Nacional de Pesaciais Espaciais, Sao Jose dos Campos, Brazil

Characterization of Lateral and Longitudinal Gradient of Tucurui Reservoir, through Statistical Analysis of Limnological Data and TM-LANDSAT Images *Caracterizacao dos gradientes longitudinais e laterais do reservatorio Tucurui/pa, Atraves da analise estatistica dos bancos de dados limnologico e de imagens TM-LANDSAT*

daSilva, Osman Fernandes, Instituto Nacional de Pesaciais Espaciais, Brazil; Dec. 1994; 138p; In Portuguese

Report No.(s): INPE-5967-TDI/571; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The large water flow and seasonality of Tocantins river affects the lateral and longitudinal stratification of the Tucurui reservoir. The statistical analyses of a data base with limnological measurements made during 5 years in the Tucurui reservoir showed that there are significant differences ($\alpha = 0,01$) in the limnological variables between the dry and the rainy season. The changes in the water flow are therefore responsible for changes in the trophic state of the Tucurui reservoir. These results were confirmed by using five TM/LANDSAT images that clearly show the lateral and longitudinal stratification of optical properties of the reservoir. The litoral zone was shown to be different from the central zone of the reservoir since it keeps a lake-type metabolism during the whole year. The importance of this region, which acts as a filter for nutrients coming from the lateral catchment basins, is also discussed.

Author

Reservoirs; Statistical Analysis; Limnology; Water Flow; Annual Variations

19970020291 Instituto Nacional de Pesquisas Espaciais, Image Processing Div., Sao Jose dos Campos, Brazil

Multispectral Image Data Fusion Under a Bayesian Approach

Mascarenhas, Nelson D. A., Instituto Nacional de Pesquisas Espaciais, Brazil; Banon, Gerald J. F., Instituto Nacional de Pesquisas Espaciais, Brazil; Candeias, Ana L. B., Instituto Nacional de Pesquisas Espaciais, Brazil; International Journal Remote Sensing; 19960201; ISSN 0143-1161; Volume 17, No. 8, pp. 1457-1471; In English

Report No.(s): INPE-6134-PRE/2234; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Multispectral image data fusion is understood here as a process that generates synthetic images from a combination of primary images, by attempting to preserve the best characteristics of each primary image. The obtained product is important in helping the users of remote sensing in visual analysis. This paper describes a new method for multispectral image data fusion using a Bayesian framework. As an example, the method is applied to the synthesis of new bands for the SPOT satellite. The method comprises two steps: (1) a new interpolator for the multispectral bands, obtained through the orthogonality principle, and leading to the estimator and its covariance matrix, which will be used as a priori information for the second step; and (2) a new statistical synthesis formulation, also obtained through the orthogonality principle, using as observations the panchromatic and the multispectral bands. Experimental results with SPOT images over Guarulhos Airport, Sao Paulo, Brazil, are presented, including both the interpolated multispectral bands and the synthetic bands. A discussion of the visual output also includes a comparison between the new interpolation process with conventional interpolators such as nearest neighbor and bilinear. Furthermore, the flexibility of the Bayesian interpolator is obtained through the possibility of using different horizontal and vertical correlation coefficients that adapt the model to the local characteristics of the image being interpolated. The proposed interpolation method also allows the use of a simple unsharp masking procedure, with improved visual edge delineation.

Author

Multisensor Fusion; Remote Sensing; Bayes Theorem

19970020318 Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Urban Management Using Remote Sensing Techniques

Pereira, Madalena Niero, Instituto Nacional de Pesquisas Espaciais, Brazil; DeLourdes Neves de Oliveira Kurkdjian, Maria, Instituto Nacional de Pesquisas Espaciais, Brazil; Feb. 1997; 13p; In English; International Astronautical Congress, 7-11 Oct. 1996, Beijing, China

Report No.(s): INPE-6129-PRE/2230; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Urban growth in Brazil is characterized by a lack of appropriate planning. Besides the current social organization, this is due to high rates of demographic growth induced by the natural increase rate of urban population, transfer of rural population to urban areas and migration from poorer to richer regions. The fast growth rates of urban population is therefore one of the main problems for effective urban management in Brazil. Disorganized growth of cities is also related to the lack of adequate tools to obtain useful information for urban management. Orbital remote sensing has been appointed to be an adequate alternative to provide such information. The possibility of fast and low cost monitoring of urban areas has been improved by the fine spatial resolution of orbital remote sensing products, as well as, by better data availability provided through the larger number of existing remote sensing platforms. This work has the objective of presenting the state of the art of the application of orbital remote sensing to urban management in Brazil. It briefly describes some of the studies carried out at the National Institute for Space Research-INPE. Several digital processing techniques have been used, such as registration of multitemporal images and IHS transformation. Integrated studies were also conducted in order to understand the process of urban growth in view of a broader land use pattern and to analyze the relationship of the urbanization process to environmental conditions.

Author

Rural Areas; Planning; Demography; Remote Sensing

19970020377 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

An Implementation of a Digital Map Overlay on a Tactical Display

Dodd, R. B., Defence Science and Technology Organisation, Australia; Oct. 1996; 28p; In English

Report No.(s): DSTO-TN-0061; AR-009-910; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, microfiche

This report describes a digital map implementation developed for overlaying a tactical information display. The digital map implementation operates over widely varying display ranges, with the ability to render both coastal outlines and shaded landforms. The report discusses features of the implementation approach, data preparation and resultant performance.

Author

Digital Data; Maps; Display Devices; Data Processing

19970020382 Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Images TM-LANDSAT and Geoprocessing at Subsidiary, the Auriferous Prospection in Setentrional Espinhaco, M.G. *Imagens Tm-LANDSAT e Geoprocessamento como Subsídio a Prospeccao Aurifera no Espinhaco Setentrional, M.G.*

Lopes, Eymar Silva Sampaio, Instituto Nacional de Pesquisas Espaciais, Brazil; Jun. 1994; 122p; In Portuguese; Original contains color illustrations

Report No.(s): INPE-5585-TDI/547; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

This work consists of a study at the septentrional part of the Serra do Espinhaco, northern Minas Gerais, region of Riacho dos Machados, through TM-LANDSAT imagery at the 1:100.000 scale. The main objective of the study was to define an area structurally favorable for gold mineralization as a result of the hydrothermal action, through the integration of physiographic, morphostructural and geologic data. This analysis is concerned with convergence evidence principle of drainage and relief elements interpreted as faults, fractures and foldings that represent favorable flues for mineralization. Taking into consideration the results achieved, the images are a very promissory tool for prospective models, thus permitting a minor cost/benefit relation. This study allowed to characterize in a region of 8.400 km² twenty anomalous areas favorable for gold prospection. It also allowed the use of geoprocessing resources for data optimization and integration, including the elaboration of a extremely clear thematic cartography, which shows all synthetized phases of information evaluation and the suggested areas for prospection.

Author

Image Analysis; Satellite Imagery; Data Integration; Investigation

19970020396 NASA Goddard Space Flight Center, Greenbelt, MD USA

Glacier Bay, Alaska, from the Ground, Air, and Space

Feb. 23, 1997; In English; Videotape: 13 min. 13 sec. playing time, in color, with sound

Report No.(s): NASA-TM-112631; NONP-NASA-VT-1997032489; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

This tape uses a combination of video, three-dimensional computer imaging, and still photographs to provide a descriptive overview of the life-cycle and environmental effects of glaciers. An historical prospective of researchers and the contribution that they have made to the understanding of glaciers and Glacier Bay is presented. The data collected from these scientists have been documented and used by means of scientific visualization in the hope of learning how glacial activity relates to climate changes. CASI

Glaciers; Environment Effects; Scientific Visualization; Climate Change; Glacial Drift; Satellite Imagery; Imaging Techniques

44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19970019293 Pennsylvania State Univ., Dept. of Physics, University Park, PA USA

Anisotropic Heat-Exchanger/Stack Configurations for Thermoacoustic Heat Engines *Final Report, 1 Oct. 1993 - 14 Sep. 1996*

Maynard, Julian D., Pennsylvania State Univ., USA; Jul. 31, 1996; 19p; In English

Contract(s)/Grant(s): N00014-93-I-1127

Report No.(s): AD-A311676; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The goal of the project was to explore the feasibility of novel configurations of heat pumping elements and heat exchangers for thermoacoustic heat engines, which have high potential for replacing refrigerators using polluting gases. The approach involved anisotropic systems, such as made possible by glass capillary array technology. This approach allows a heat exchange fluid to flow directly across the heat pumping element of the thermoacoustic heat engine (the 'stack'), eliminating the necessity of separate heat exchangers and possibly improving efficiency. The research successfully determined both the theoretical and technological feasibility of the approach, and an actual prototype of an anisotropic stack/heat-exchanger unit was constructed. A part of the project involved the development of high power thermoacoustic refrigerators for testing the new systems. The research resulted in two patent disclosures.

DTIC

Heat Engines; Heat Exchangers; Heat Pumps; Thermodynamics; Acoustics

19970019594 Naval Surface Warfare Center, Silver Spring, MD USA

Rechargeable Lithium Cells with High Energy Density Transition Metal Compound Cathodes: Characterization in AA-Size Cells Final Report, 24 Sep. 1989 - 1 Mar. 1992

Lin, H.-P. W., Naval Surface Warfare Center, USA; Kelly, C. J., Naval Surface Warfare Center, USA; Chua, D. L., Naval Surface Warfare Center, USA; Smith, P. H., Naval Surface Warfare Center, USA; James, S. D., Naval Surface Warfare Center, USA; Apr. 1996; 36p; In English

Contract(s)/Grant(s): N60921-89-D-0039

Report No.(s): AD-A318903; CARDIVSWC-TR-95/O34; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Lithium/lithium cobalt oxide cells were packaged in Size AA containers. Cell capacity was 0.85 Ah for discharge of the Li(x)CoO₂ cathode over the range of x from zero to unity (100 percent depth of discharge (DOD)). Cells were discharged at 37.5, 50, and 75 percent DOD. The latter depth was unusually severe as this system is typically limited to about 50 percent DOD. Cycling at cathode current densities of 1, 5, and 10 ma/sq cm and at both zero and 22 deg C allowed comparison to previously-evaluated lithium cells with other cathode materials. While the results generally were in agreement with data for 7- to 30-Ah Li/Li(x)CoO₂ cells, two findings were unexpected. First, five to ten cycles could be obtained at the highest DOD before a continuously declining capacity fell below that obtained at 50 percent DOD, and useful cycles were attained thereafter. Second, at 37.5 DOD, twice the number of cycles were obtained at 22 deg C as at - 2 deg C. In all previous testing, no temperature dependence had been observed. The limited number of replicates in this test prompts caution interpreting the results.

DTIC

Transition Metals; Cobalt Oxides; Electrochemical Cells; Lithium Oxides; Electric Batteries

19970019629 Institut fuer Solare Energieversorgungstechnik e.V., Kassel, Germany

Carrying out a program for the support of photoelectric compact systems, 3. ed. Durchfuehrung eines Programmes zur Foerderung photovoltaischer Kompaktsysteme

Bendel, C., Institut fuer Solare Energieversorgungstechnik e.V., Germany; 1996; 44p; In German

Contract(s)/Grant(s): BMBF 032900

Report No.(s): ETDE-DE-381; DE96-770711; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche; US Sales Only; US Sales Only

The work target of the project consists of solving scientific/technical problems in the field of system technique of photoelectric compact systems of small output: - Reducing the manufacturing costs - Improving the efficiency - Improving the transfer of know-how from Research Institutions to industry - Supporting small and medium sized firms - Supporting the trade by improved transfer of know-how.

DOE

Photoelectricity; Photoelectric Materials; Photovoltages

19970019981 Fokker Space and Systems, Leiden, Netherlands

Holddown Interface Load Cells: A Validation Tool

Slagter, Gerrit, Fokker Space and Systems, Netherlands; Winter, Berend, Fokker Space and Systems, Netherlands; Cruijssen, Henk J., Fokker Space and Systems, Netherlands; Nineteenth Space Simulation Conference Cost Effective Testing for the 21st Century; Jan. 1997, pp. 207-218; In English; Also announced as 19970019961; No Copyright; Avail: CASI; A03, Hardcopy; A04, microfiche

This paper deals with the definition and application of a test tool used during dynamic testing at Fokker Space. It shows the reason for introducing such a tool. Also, a short description is given of the development testing which was done at Fokker Space. Finally, it shows that with the help of this test tool, mechanical overloading of solar arrays can be avoided and that the customer can be convinced that required interface loads to be seen during testing have been achieved.

Author

Solar Arrays; Loads (Forces); Space Environment Simulation

19970019999 Fokker Space and Systems, Leiden, Netherlands

Video Aided Inspection of Solar Arrays

vanderVegt, Dick, Fokker Space and Systems, Netherlands; Naber, Frits H., Fokker Space and Systems, Netherlands; Nineteenth Space Simulation Conference Cost Effective Testing for the 21st Century; Jan. 1997, pp. 403-414; In English; Also announced as 19970019961; No Copyright; Avail: CASI; A03, Hardcopy; A04, microfiche

This paper deals with a new inspection method for arrays used in space. A major topic of Full Visual Inspection (FVI) is the detection of possible defects of solar cells such as cracks in solar cells, coverglass cracks, edge- and corner chips. Currently the

inspection is carried out by visual observation of each cell with the aid of a stereo microscope. A new inspection method was developed and tested at Fokker Space. This inspection method is based on both an Infrared Video system and a visual light Hi-res. video system. The system is capable of digital recording each image of a solar cell. The system offers a reduction in through-put time and provides better ergonomics and improves safety.

Author (revised)

Solar Arrays; Visual Observation; Video Tape Recorders; Digital Systems; Infrared Instruments; Inspection

19970020000 Fokker Space and Systems, Leiden, Netherlands

Ambient Pressure Thermal Cycling Test Facility for Solar Panels

Geerse, Jan C., Fokker Space and Systems, Netherlands; Mertens, Jos H., Fokker Space and Systems, Netherlands; Nineteenth Space Simulation Conference Cost Effective Testing for the 21st Century; Jan. 1997, pp. 415-419; In English; Also announced as 19970019961; No Copyright; Avail: CASI; A02, Hardcopy; A04, microfiche

The acceptance test of solar panels for spacecraft was formerly performed in vacuum to find workmanship failures. Fokker Space BV, in cooperation with ESTEC, has developed an alternative which is cheaper and faster: the Ambient Pressure Thermal Cycling (APTC) test. This paper describes the validation of this test approach for acceptance testing of solar panels. Further it describes the construction and performance of the test facility and its cost and time effectiveness.

Author

Thermal Cycling Tests; Test Facilities; Solar Cells; Cost Effectiveness

19970020102 Purdue Univ., West Lafayette, IN USA

Gyrodynamic Effects of an Energy Storage Flywheel on the Handling of a Hybrid-Electric Vehicle

Greer, James L., Purdue Univ., USA; Jan. 09, 1997; 145p; In English

Report No.(s): AD-A320371; AFIT-96-101; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

This research presents the results of numerical simulation of the handling characteristics of a hybrid-electric vehicle which uses a flywheel for temporary energy storage. The work is presented in an effort to understand the potential interaction of the flywheel and the vehicle, and to predict what positive and negative outcomes may result. The vehicle is modeled with four wheels, and the roll, yaw, and sideslip-angle degrees of freedom. The simulation uses an empirical model of the nonlinear interface between the tire and the road. The results are presented graphically, and are analyzed on both quantitative and qualitative bases. The vehicle parameters used to define the baseline vehicle are based on the broad guidelines set forth by the Partnership for a New Generation of Vehicles. The size and speed range of the flywheel is based on a compilation of results presented in the popular literature. Analyses of the results are based on alignment of the angular momentum vector of the flywheel along the three axes of the vehicle. The speed of the flywheel is varied from -100,000 rpm to +100,000 rpm. Negative speeds represent orientation of the angular momentum vector of the flywheel along the negative axes, and positive speeds represent orientation along the positive axes.

DTIC

Electric Motor Vehicles; Flywheels; Energy Storage; Digital Simulation

45

ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19970019350 Instituto Nacional de Pesquisas Espaciais, ,Sao Jose dos Campos Brazil

Observations of the Atmospheric Methane in Brazil *Observacoes do Metano Atmosferico no Brasil*

Alvala, Plinio Carlos, Instituto Nacional de Pesquisas Espaciais, Brazil; Dec. 1995; 130p; In Portuguese

Report No.(s): INPE-5969-TDI/573; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The first measurements of atmospheric methane (CH₄) in the lower troposphere in different locations in Brazil are presented and, its flux in a lake of the Pantanal area in Mato Grosso. For the quantitative determination of the CH₄ concentration, a gas chromatograph with a flame ionization detector was optimized. Surface methane concentrations at Natal (6 deg S) and Cuiaba (16 deg S) are compared with data for marine stations at nearby latitudes obtained by other authors. The yearly averages for Natal (1993:1675 +/- 28 ppbv, 1994:1682 +/- 29 ppbv) and its seasonal behavior agree with the marine station, although, the data show a large dispersion. The seasonal amplitude is only 1% of the averages. The concentrations for Cuiaba are much larger than expected. This result appears to be related to the presence of local sources, such as burnings in the dry season. Methane profiles obtained in the lower troposphere, during the wet and dry seasons using a Bandeirante aircraft show an increase in the average

concentration profile for Cuiaba (1665 +/- 24 ppbv, wet season and, 1717 +/- 15 ppbv, dry season). Measurements of methane fluxes in a lake of the Pantanal for two seasons, show average fluxes of 76 +/- 110 mg CH₄/sq m/day (April) and 32 +/- 52 mg CH₄/sq m/day (August-September) comparable to Amazonian wetlands.

Author

Air Pollution; Methane; Troposphere; Brazil; Gas Chromatography

19970019500 Office of the Under Secretary of Defense (Acquisitions), Washington, DC USA

Pollution Prevention

Gootee, W., Office of the Under Secretary of Defense (Acquisitions), USA; Jun. 18, 1996; 22p; In English
Report No.(s): AD-A316513; DODI-4715.4; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This Instruction implements policy, assigns responsibility, and prescribes procedures under DoD Directive 4715.1 for implementation of pollution prevention programs throughout the Department of Defense. It designates Executive Agents to lead DoD implementation of key pollution prevention programs. Executive Agents are specified in enclosure 2.

DTIC

Pollution Control; Environment Protection

19970019536 Science and Technology Corp., Hampton, VA USA

Natural Environmental Effects In Military Models and Simulations, Part 2, A Survey of Capabilities *Topical Report*

Burgeson, John C., Science and Technology Corp., USA; Piwowar, Thomas M., Science and Technology Corp., USA; Try, Paul D., Science and Technology Corp., USA; Aug. 1996; 320p; In English
Contract(s)/Grant(s): F19628-95-C-0005; AF Proj. 6670

Report No.(s): AD-A317148; STC-TR-2968; PL-TR-96-2040; No Copyright; Avail: CASI; A14, Hardcopy; A03, microfiche

The Defense Modeling and Simulation Office (DMSO) has sponsored the Environmental Effects for Distributed Interactive Simulation (E(sup 2)DIS) Project, which is composed of eight tasks including the Survey Task. The Survey Task had three objectives: to develop a baseline of the Military Services current requirements for incorporation of the atmosphere and near-space environment and their effects in military models and simulations (the Requirements Survey), to identify atmospheric and near-space environmental models and databases and effects models and databases that are currently available from the services (the Capabilities Survey), and to compare the results from both survey efforts and make appropriate recommendations. In a series of three reports, Part I describes the results and findings from the Requirements Survey; this report, Part II, describes the results and findings from the Capabilities Survey; and Part 3 compares and assesses the results of both surveys. The Survey Team received questionnaires for 152 models and databases that were quality controlled and entered into an automated database management system for analysis. The results of the analysis are presented in this report. Both the Capabilities Survey database and the Requirements Survey database are available from PL/GPAA.

DTIC

Environment Effects; Environment Models; Atmospheric Models; Distributed Interactive Simulation

19970019621 Louisiana State Univ., Center for Coastal, Energy and Environmental Resources, Baton Rouge, LA USA

Functional Comparison of Created and Natural Wetlands in the Atchafalaya Delta, Louisiana *Final Report*

Faulkner, Stephen P., Louisiana State Univ., USA; Poach, Matthew E., Louisiana State Univ., USA; Sep. 1996; 108p; In English
Report No.(s): AD-A317335; WES/TR/WRP-RE-16; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The ability of created wetlands to function as natural systems has been questioned because most wetlands studied have been new created wetlands instead of old natural wetlands. Quantitative data were needed to verify functional equivalency in wetlands of similar ages. One natural and one created wetland was selected for each of three age classes. An additional natural 'old' wetland was added to ensure a valid comparison. SOils were evaluated for bulk density, pH, moisture content, particle size, carbon, phosphorus content, and nitrogen content.

DTIC

Wetlands; Quantitative Analysis; Chemical Composition

19970019880 Thermo Nutech, Oak Ridge, TN USA

Johnston Atoll Plutonium Contaminated SOil Cleanup Project *Quarterly Report, 7 Feb. - 30 Apr. 1994*

Doane, Richard W., Thermo Nutech, USA; Grant, Robert H., Thermo Nutech, USA; Nov. 1996; 414p; In English
Contract(s)/Grant(s): DNA001-93-C-0148

Report No.(s): AD-A318567; DNA-TR-95-100; No Copyright; Avail: CASI; A18, Hardcopy; A04, microfiche

TMA/Eberline is the prime contractor for the Defense Nuclear Agency (DNA), responsible for the operation and maintenance of the Johnston Atoll Plutonium Contaminated SOIL Cleanup Project. During this production period, the Scope of Work included movement of soil to and from the plant, processing contaminated soil through the Segmented Gate System (SGS) and SOIL Washing System, packaging of waste soil for shipment, identification and implementation of process improvements, data collection and validation, and compliance with all applicable regulations governing environmental safety and health. The SGS utilizes arrays of sensitive radiation detectors coupled with sophisticated computer software to segregate contaminated soil from a moving feed supply on conveyor belts. Contaminated soil is diverted to a 'hot' path for plutonium particles greater than 5000 Becquerels or to a supplemental soil washing process designed to remove dispersed low level contamination from a soil fraction consisting of very small particles. Low to intermediate levels of contamination are removed from the soil to meet DNA's criteria for unrestricted use of less than 500 Becquerels per kilogram of soil, with no 'hot' particles. The low level concentrate is expected to be packaged for shipment to an approved defense waste disposal site.

DTIC

Waste Disposal; Radioactive Contaminants; Plutonium; Atolls; Cleaning; SOIL Pollution

19970019881 King and Associates, Washington, DC USA

National Wetland Mitigation Banking Study. Commercial Wetland Mitigation Credit Markets: Theory and Practice

Scodari, Paul, King and Associates, USA; Shabman, Leonard, Virginia Polytechnic Inst. and State Univ., USA; White, David, Virginia Polytechnic Inst. and State Univ., USA; Nov. 1995; 103p; In English

Report No.(s): AD-A316814; IWR-92-WMB-7; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The primary Federal regulatory program governing wetlands is authorized by Section 404 of the Clean Water Act. Similarly structured state and local permit programs also exist. In most instances, wetlands permitting is, by formal regulation, expected to follow a mitigation 'sequence' where the applicant for a permit must first show that the proposed activity has been designed to avoid wetlands to the maximum extent. If avoidance is not possible, then the minimization of filling must be achieved. Finally, if a permit is granted, compensation by restoration of degraded wetlands or by creation of wetlands from uplands is required on-site (as close as possible to the permitted activity). Also, the same kind of wetland is to be provided. At times, permittees have been allowed to compensate by developing a single off-site compensation project when on-site possibilities for wetlands construction or restoration are limited. Some permit applicants, who expect to initiate several future projects requiring mitigation, have been allowed to meet these requirements by being allowed to meet these requirements by developing one large off-site mitigation project. This is the general definition of a 'single-user' wetland mitigation bank (or a 'joint-project' bank, if the bank is developed and used jointly by more than one sponsor). However, most permit applicants have only one or a few prospective projects of too small a size to warrant developing a single user bank. In such cases, permit applicants could potentially satisfy their mitigation requirements by purchasing mitigation credits (some measure of wetland function and area) from a commercial credit supply venture (e.g., a commercial mitigation bank).

DTIC

Environment Management; Environmental Control; Water Pollution; Hazardous Wastes; Wetlands

19970020060 South Dakota School of Mines and Technology, Inst. of Atmospheric Sciences, Rapid City, SD USA

First Estimates of the Radiative Forcing of Aerosols Generated from Biomass Burning Using Satellite Data

Christopher, Sundar A., South Dakota School of Mines and Technology, USA; Kliche, Donna A., South Dakota School of Mines and Technology, USA; Chou, Joyce, South Dakota School of Mines and Technology, USA; Welch, Ronald M., South Dakota School of Mines and Technology, USA; Journal of Geophysical Research; Sep. 27, 1996; ISSN 0148-0227; Volume 101, No. D16, pp. 21,265-21,273; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS1-19077; NAGw-3740

Report No.(s): NASA-CR-204573; NAS 1.26:204573; AGU-Paper 96-JD02161; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, microfiche

Collocated measurements from the Advanced Very High Resolution Radiometer (AVHRR) and the Earth Radiation Budget Experiment (ERBE) scanner are used to examine the radiative forcing of atmospheric aerosols generated from biomass burning for 13 images in South America. Using the AVHRR, Local Area Coverage (LAC) data, a new technique based on a combination of spectral and textural measures is developed for detecting these aerosols. Then, the instantaneous shortwave, longwave, and net radiative forcing values are computed from the ERBE instantaneous scanner data. Results for the selected samples from 13 images show that the mean instantaneous net radiative forcing for areas with heavy aerosol loading is about -36 W/sq m and that for the

optically thin aerosols are about -16 W/sq m. These results, although preliminary, provide the first estimates of radiative forcing of atmospheric aerosols from biomass burning using satellite data.

Author

Aerosols; Biomass; Satellite Observation; Advanced Very High Resolution Radiometer; Earth Radiation Budget Experiment; Detection

19970020234 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA

Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop

Pickett, Lorri A., Editor, Johns Hopkins Univ., USA; Jul. 1995; 239p; In English, 13-14 Jul. 1995, San Diego, CA, USA; Sponsored by Department of the Army, USA; Also announced as 19970020235 through 19970020256

Contract(s)/Grant(s): N00014-91-C-0001

Report No.(s): CPIA-Publ-626; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Topics covered include: Risk assessment of hazardous materials, Automated systems for pollution prevention and hazardous materials elimination, Study design for the toxicity evaluation of ammonium perchlorate, Plasma sprayed bondable stainless surface coatings, Development of CFC-free cleaning processes, New fluorinated solvent alternatives to ozone depleting solvents, Cleaning with highly fluorinated liquids, Biotreatment of propyleneglycol nitrate by anoxic denitrification, Treatment of hazardous waste with white rot fungus, Hydrothermal oxidation as an environmentally benign treatment technology, Treatment of solid propellant manufacturing wastes by base hydrolysis, Design considerations for cleaning using supercritical fluid technology, and Centrifugal shear carbon dioxide cleaning.

CASI

Cleaning; Hazardous Wastes; Hazardous Materials; Hydrolysis; Pollution Control; Propellants; Solvents; Supercritical Fluids; Environment Protection; Rocket Engines; Waste Water; Conferences

19970020235 Armstrong Lab., Wright-Patterson AFB, OH USA

Risk Assessment of Hazardous Materials: The Role of Toxicology

Mattie, David R., Armstrong Lab., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 17-22; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

The chemical risk assessment process and the need for health-based approaches to identify and characterize potential hazardous substances will be explained in this paper. The risk assessment process can be applied to both workplace and environmental settings. Toxicology will be defined and related to the risk assessment process. A brief overview of toxicity screens and tests will be presented in order to help make toxicity data more meaningful. Toxicity data for Halon 1301 replacements and trichloroethylene (TCE) will be presented as examples. The paper will conclude with a description of TriService Toxicology; what it is and what this laboratory can provide to the Department of Defense (DOD), industry and academia.

Author

Risk; Hazardous Materials; Toxicology; Toxicity

19970020236 TRW Environmental Services, Redondo Beach, CA USA

Automated Systems for Pollution Prevention and Hazardous Materials Elimination

Sigler, Doug, TRW Environmental Services, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 23-26; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Automation of the environmental health and safety (EHS) management process is addressed. The importance of identifying sources of the EHS data, and supporting and maintaining the data over time is discussed. Automated EHS systems evolution and future directions of these systems are also examined.

CASI

Information Management; Hazardous Materials; Environment Management; Information Systems; Safety Management; Pollution Control

19970020237 Armstrong Lab., Tri-Service Toxicology Consortium, Wright-Patterson AFB, OH USA

Study Design for the Toxicity Evaluation of Ammonium Perchlorate

Caldwell, Daniel J., Armstrong Lab., USA; Mattie, David R., Armstrong Lab., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 27-33; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Ammonium perchlorate (AP), CAS registry number 7790-98-9, is used as a class 1.1 oxidizer in solid rocket engine propellant mixtures. Production and storage has resulted in the contamination of soil and water resources on government and contractor installations. In 1992 the US Environmental Protection Agency (EPA) established a provisional reference dose (RfD) of 1E-04 mg/kg/day ammonium perchlorate. Remediation levels will be based on this provisional RfD. While EPA was thorough in its evaluation of the literature cited, the analysis relied upon standard default uncertainty factors to determine the RfD. In light of recently available data, the provisional RfD may be overly conservative. If adopted, the provisional RfD will result in millions of dollars being spent on unnecessary cleanup.

Author

Ammonium Perchlorates; Toxicity; Thyroid Gland; Hormones; Contamination

19970020238 TRW Systems Group, San Bernardino, CA USA

An Automated Tool for Opportunity Assessments and Technical Order Changes: PADS

Smith, Clifford J., TRW Systems Group, USA; Vitt, Stanley P., TRW Systems Group, USA; Cox, Larry W., TRW Systems Group, USA; Wilson, Rick M., TRW Systems Group, USA; Secrist, Daniel S., TRW Systems Group, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 35-39; In English; Also announced as 19970020234

Contract(s)/Grant(s): F42610-92-C-0100; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

TRW Environmental Systems has developed an automated pollution prevention tool (called PADS for Pollution Prevention Assessment and Decision Support System) to support the performance of opportunity assessments and technical order ODC/EPA 17 replacement tasks. PADS is a portable PC system of four integrated software modules that assist in the performance of input and output stream characterization and database development, substitution/process option generation, substitution option assessment, and decision support. PADS was developed as part of an IR&D program, and has been demonstrated at Sacramento ALC to perform a paint area opportunity assessment and to support the identification and selection of substitutes to replace ODCs in USAF missile logistics center technical orders. PADS offers the advantages of efficiency in data entry and manipulation, database development, a resident set of 2000+ ODC and EPA 17 substitutes, a scanned-in EPA library of successful process substitutes, life cycle cost analysis programs, and a consensus building decision support system. All of these capabilities are transportable to the job site to support quick turnarounds for review, analysis, consolidation, and on-site decision support.

Author

Pollution Control; Computer Programs; Data Processing; Research and Development

19970020239 Lockheed Martin Corp., Baltimore, MD USA

Plasma Sprayed Bondable Stainless Surface (BOSS) Coatings for Corrosion Protection and Adhesion Treatments

Davis, G. D., Lockheed Martin Corp., USA; Groff, G. B., Lockheed Martin Corp., USA; Rooney, M., Lockheed Martin Corp., USA; Cooke, A. V., Lockheed Martin Corp., USA; Boothe, R., AC Engineering, Inc., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 41-50; In English; Also announced as 19970020234

Contract(s)/Grant(s): NAS8-40197; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Plasma-sprayed Bondable Stainless Surface (BOSS) coatings are being developed under the Solid Propulsion Integrity Program's (SPIP) Bondlines Package. These coatings are designed as a steel case preparation treatment prior to insulation lay-up. Other uses include the exterior of steel cases and bonding surfaces of nozzle components. They provide excellent bondability - rubber insulation and epoxy bonds fail cohesively within the polymer - for both fresh surfaces and surfaces having undergone natural and accelerated environmental aging. They have passed the MSFC requirements for protection of inland and sea coast environment. Because BOSS coatings are inherently corrosion resistant, they do not require preservation by greases or oils. The reduction/elimination of greases and oils, known bondline degraders, can increase SRM reliability, decrease costs by reducing the number of process steps, and decrease environmental pollution by reducing the amount of methyl chloroform used for degreasing and thus reduce release of the ozone-depleting chemical in accordance with the Clean Air Act and the Montreal Protocol. The

coatings can potential extend the life of RSRM case segments and nozzle components by eliminating erosion due to multiple grit blasting during each use cycle and corrosion damage during marine recovery. Concurrent work for the Air Force show that other BOSS coatings give excellent bondline strength and durability for high-performance structures of aluminum and titanium.

Author

Metal Surfaces; Plasma Spraying; Coatings; Corrosion Resistance; Environment Protection; Adhesive Bonding; Corrosion Tests; Tensile Tests

19970020240 Naval Air Warfare Center, Research and Technology Div., China Lake, CA USA

CFC-Free Technology for Missile Electronics

Fischer, J., Naval Air Warfare Center, USA; Smith, J., Naval Air Warfare Center, USA; Nickell, R., Naval Air Warfare Center, USA; Merwin, L., Naval Air Warfare Center, USA; Nissan, R., Naval Air Warfare Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 51-58; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Ozone depleting substances (ODS) have been employed in the fabrication and maintenance of missile electronics/avionics because of their cleaning efficiency and low toxicity CFC-113 and methyl chloroform, the most widely used solvents, must be replaced by 1 January 1996 in all electronics applications of missile technology. Because of the high sensitivity of electronics to post soldering and processing residues caution must be exercised when developing or choosing replacement materials. This paper describes three alternatives for electronics fabrication and cleaning: (1) use of water soluble flux and aqueous cleaning, (2) no-clean or low residue soldering technology, and (3) semi-aqueous solvent cleaning. The scope and limitations of these three options will be described.

Author

Soldering; Solvents; Aqueous Solutions; Electronic Equipment; Cleaning; Fabrication; Environment Protection; Avionics

19970020241 NASA White Sands Test Facility, NM USA

Development of CFC-Free Cleaning Processes at the NASA White Sands Test Facility

Beeson, Harold, NASA White Sands Test Facility, USA; Kirsch, Mike, NASA White Sands Test Facility, USA; Hornung, Steven, Allied-Signal Technical Services Corp., USA; Biesinger, Paul, Allied-Signal Technical Services Corp., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 59-65; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

The NASA White Sands Test Facility (WSTF) is developing cleaning and verification processes to replace currently used chlorofluorocarbon-113- (CFC-113-) based processes. The processes being evaluated include both aqueous- and solvent-based techniques. The presentation will include the findings of investigations of aqueous cleaning and verification processes that are based on a draft of a proposed NASA Kennedy Space Center (KSC) cleaning procedure. Verification testing with known contaminants, such as hydraulic fluid and commonly used oils, established correlations between nonvolatile residue and CFC-113. Recoveries ranged from 35 to 60 percent of theoretical. WSTF is also investigating enhancements to aqueous sampling for organics and particulates. Although aqueous alternatives have been identified for several processes, a need still exists for nonaqueous solvent cleaning, such as the cleaning and cleanliness verification of gauges used for oxygen service. The cleaning effectiveness of tetrachloroethylene (PCE), trichloroethylene (TCE), ethanol, hydrochlorofluorocarbon-225 (HCFC-225), tert-butylmethylether, and n-Hexane was evaluated using aerospace gauges and precision instruments and then compared to the cleaning effectiveness of CFC-113. Solvents considered for use in oxygen systems were also tested for oxygen compatibility using high-pressure oxygen autoignition and liquid oxygen mechanical impact testing.

Author

Cleaning; Solvents; Aqueous Solutions; Impact Tests

19970020242 Naval Weapons Station, Weapons Quality Engineering Center, Concord, CA USA

Alternative CFC-Free Cleaning and Degreasing Process for TF-34 and T-56 Engine Components

Tse, Kelvin, Naval Weapons Station, USA; Smith, William, Defense General Supply Center, USA; Tripathi, Hem, Defense General Supply Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 67-79; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Although 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113) is an effective cleaner for the vapor degreasing of TF-34 and T-56 aircraft engine components, it is ozone depleting and will be phased-out in December 31, 1995. In order to continue to clean engine components prior to rework or electroplating, the end users of CFC-113 must find new environmentally safe cleaners and degreasing methods to replace the CFC-113 vapor degreasing process. This paper summarizes some work being done on finding alternative cleaners for the replacement of CFC-113 vapor degreasers and provides a few practical screening steps that other end users can use to modify or replace their CFC-113 cleaning and degreasing processes. The evaluation presented in this paper will show that in order to find acceptable replacement cleaners for the degreasing process, numerous commercially available cleaners were considered. These chemicals were evaluated based on a cleaner selection criteria. These chemicals were tested for the degreasing efficiency, potential for aircraft component corrosion, metal surface particulate cleanliness, and aircraft component material compatibility. The results of these tests revealed that several cleaners can effectively replace the CFC-113 vapor degreasing of TF-34 and T-56 engine components. These new cleaners are recommended to be used with immersion tanks or high pressure spray washers to achieve the best cleaning results.

Author

Cleaning; Tf-34 Engine; T-56 Engine; Engine Parts; Cleaners; Corrosion Tests; Cost Analysis; Solvents; Performance Tests

19970020243 Minnesota Mining and Mfg. Co., Specialty Chemicals Div. Lab., Saint Paul, MN USA

New Fluorinated Solvent Alternatives to Ozone Depleting Solvents

Owens, J. G., Minnesota Mining and Mfg. Co., USA; Klink, F. W., Minnesota Mining and Mfg. Co., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 81-83; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

A new family of fluorinated fluids has been identified which can satisfy the requirements for many of the demanding cleaning applications where Ozone Depleting Substances (ODS) have been used. Hydrofluoroethers (HFE's) have physical properties and cleaning performance which closely resemble the ODS solvents they are intended to replace. In addition, this class of compounds has no ozone depletion potential, are not volatile organic compounds, have short atmospheric lifetimes and low global warming potentials, resulting in broader environmental acceptability.

Derived from text

Solvents; Cleaning; Environment Protection; Cleaners

19970020244 Du Pont de Nemours (E. I.) and Co., Haskell Lab., Newark, DE USA

Toxicology Assessment of HFC-4310mee: An Alternative Cleaning and Degreasing Material

Kennedy, G. L., Du Pont de Nemours (E. I.) and Co., USA; Brock, W. J., Du Pont de Nemours (E. I.) and Co., USA; Trochimowicz, H. J., Du Pont de Nemours (E. I.) and Co., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 85-105; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

HFC-4310mee (Pentane, 1,1,1,2,2,3,4,5,5,5-decafluoro-; CAS No. 138495-42-8) is a colorless liquid, non-ozone-depleting CFC alternative for cleaning and degreasing in industrial processes. The material is not very toxic following acute inhalation exposure with a 4-hour approximate lethal concentration in rats of 10,000 ppm. The chemical is slightly irritating to the eye and skin of rabbits. Cardiac sensitization was not seen in dogs at 5,000 ppm (10,000 ppm produced convulsions). Repeated nose-only exposures of from 500 to 4,000 ppm, 6 hr/day, 5 days/wk for 2 weeks produced no significant toxicologic findings. In a similar study conducted for 90 days, rats exposed whole-body to either 2,000 or 3,500 ppm showed signs of toxicity including convulsions, tremors, abnormal gait, and jerky movements during exposures which were not seen post-exposure. Decreased motor activity was also seen at 3,500 ppm the day after exposure. No tissue changes were observed at any concentration tested and the no-observed-adverse-effect level was 500 ppm. HFC-4310mee was not mutagenic in *Salmonella typhimurium* or *Escherichia coli* or in rats exposed up to 7,000 ppm as measured by the micronucleus test. No evidence of enhanced fetal sensitivity was seen in a developmental toxicity study in which rats were exposed to either 500, 2,000 or 3,500 ppm. Abnormal behavior was seen in maternal rats at 2,000 and 3,500 ppm and fetal weights were reduced at 3,500 ppm. Based on the above information, DuPont has recommended that workplaces be controlled such that 8- and 12-hour TWA concentrations of 200 ppm be maintained and a 15-minute ceiling of 400 ppm should be in place.

Author

Cleaners; Cleaning; Toxicology; Toxicity; Pentanes; Liquids; Fluorination

19970020245 Petroform, Inc., Fernandina Beach, FL USA

Cleaning with Highly Fluorinated Liquids

Hayes, Michael E., Petroform, Inc., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 107-114; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

For many cleaning tasks, vapor degreasing is the only type of process which performs fully satisfactorily. To meet this need, cosolvent processes using organic solvents and perfluorocarbons have been developed which behave as vapor degreasing processes in almost every respect. Due to their long atmospheric lifetimes, PFC's have been seen as interim solutions in most such applications. Highly (but incompletely) fluorinated compounds (HFC's) with suitable characteristics are now becoming available which can replace PFC's in cosolvent processes. These HFC's will likely serve as permanent replacements for ozone-depleting solvents in cleaning applications requiring vapor degreasing or equivalent processes. This paper discusses properties and behavior of some of these substances as they are related to cosolvent processes.

Author

Fluorination; Cleaning; Solvents; Liquids

19970020246 Army Construction Engineering Research Lab., Champaign, IL USA

Feasibility and Limitations of Biological Treatment Technologies for Nitrocellulose Fines in Processing Wastewater

Kim, Byung J., Army Construction Engineering Research Lab., USA; Alleman, James E., Purdue Univ., USA; Quivey, David, Purdue Univ., USA; Freedman, David L., Illinois Univ., USA; Caenepeel, Bryan, Illinois Univ., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 115-123; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Since nitrocellulose (NC) is generally known as a biologically recalcitrant substance, there has been limited research to biologically treat NC. Nevertheless, the U.S. Army Construction Engineering Research Laboratories (USACERL) has initiated biological treatment research for NC fines based on the assumptions that even partial biodegradation would convert NC fines to nonhazardous waste and that this biological treatment would be cost effective for low-concentration, high-volume wastewater. Technology alternatives included anaerobic treatment, alkaline hydrolysis and treatment, and fungal treatment. This paper discusses the status of NC fines biological treatment research, primarily emphasizing: (1) alkaline hydrolysis and subsequent anoxic/aerobic treatment, and (2) ongoing anaerobic treatment research. Based on a thorough analysis of alkaline digestion process of NC, subsequent biological treatment was optimized. For comparison, the initial experimental data of direct anaerobic treatment is also presented. In this treatment, a modified cold acid digestion/titration assay and bomb calorimetry were used to determine the percent nitrogen and energetic characteristics of NC. At present, alkaline hydrolysis and subsequent anoxic/aerobic treatment is a practical technology to treat NC fines. Although the recent laboratory data indicates that direct anaerobic treatment is a promising technology, further research is needed to develop baseline data and engineering concepts for anaerobic treatment.

Author

Waste Water; Cellulose Nitrate; Biodegradation; Hydrolysis; Treatment

19970020247 Naval Surface Warfare Center, Indian Head, MD USA

Biotreatment of Propyleneglycol Dinitrate Wastewater Containing High Inorganic Nitrate by Anoxic Denitrification

Stacy, Johnathan R., Naval Surface Warfare Center, USA; Krzewinski, Jay, EFX Systems, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 125-129; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

In this paper we will report on work at EFX Systems and Indian Head Division, Naval Surface Warfare Center to demonstrate anoxic denitrification of propyleneglycol dinitrate (PGDN) wastewater containing high inorganic nitrate. The purpose of this demonstration is to show that anoxic denitrification can reduce the concentration of PGDN to below 1 ppm concentration in the treated effluent. The wastewater is produced during final stages of purification after the nitration of propyleneglycol with a mixed acid containing concentrated nitric and sulfuric acids. The PGDN is first separated from the spent acid, then purified by a series of carbonate and water washes. The spent carbonate solution and wastewater from these washes are combined into one wastewater stream that is passed through a series of settling tanks to remove any suspended PGDN. The resulting waste stream contains 220 ppm of PGDN on average, 1200 ppm max. The concentration of salts may be as high as 6% by weight. The composition of these salts on a dry weight basis is: 70-75% NaNO₃, 2-3% Na₂SO₄, 20% Na₂CO₃, 2-3% NaHCO₃. The maximum flow rate of the stream is 20 gpm with 7000 gallons a day average total flow. This wastewater stream would be inhibitory to both aerobic and

anaerobic organisms typically used in biotreatment methods. The high nitrate concentration makes this stream a candidate for anoxic denitrification. Anoxic denitrification is a process where typically aerobic organisms in the absence of dissolved oxygen and in the presence of high nitrate will switch to a modified form of aerobic respiration using oxygen from the conversion of nitrate to molecular nitrogen. In this process the PGDN will be denitrated and then mineralized as a carbon/energy source. EFX systems is performing bench scale testing. The results of these tests will be reported. Indian Head is performing the engineering design for installation of a full scale demonstration reactor. Indian Head will also be performing aquatic toxicity testing on the effluent from a bench scale reactor run with 600 gallons of nitrator wastewater. The status of this work will be reported. EFX and Indian Head will run the demonstration reactor to treat 20 gpm of PGDN wastewater. This demonstration is scheduled to start August 1995.

Author

Waste Water; Inorganic Nitrates; Treatment; Dinitrates

19970020248 Naval Surface Warfare Center, Indian Head, MD USA

Treatment of Hazardous Waste with White Rot Fungus

Renner, Rolf H., Naval Surface Warfare Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 131-133; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

White Rot Fungi (WRF), their potential, and historical results are discussed in relation to biodegradation of TNT, RDX, and HMX.

CASI

Biodegradation; Fungi; Hazardous Wastes; Environment Protection

19970020249 Jacobs Services Co., Vandenberg AFB, CA USA

Titan SLC-4 Propellant Systems Review at Vandenberg Air Force Base

Myers, J. R., Jacobs Services Co., USA; Roberts, S., Jacobs Services Co., USA; Kasper, J. A., Department of the Air Force, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 135-161; In English; Also announced as 19970020234

Contract(s)/Grant(s): F04703-90-C-0002; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

A study was conducted by Jacobs Services Company for the USA Air Force at Vandenberg Air Force Base to assess the Titan hypergolic propellant systems at Space Launch Complex Four (SLC-4) for Waste Minimization and Pollution Prevention opportunities. The study included a complete evaluation of all active propellant systems/operations and their respective support systems. AutoCad process flow diagrams were developed, and emission source and waste stream identification was performed. The use of ozone depleting chemicals related to propellant operations was evaluated, and substitutes and alternative methods were identified. A full environmental analysis was performed based upon both current and pending regulations. Based on this knowledge, a series of options was developed and evaluated for potential site implementation. Treatability testing of oxidizer and fuel scrubber liquor effluent streams was also conducted, and may lead to innovative processing methods at the VAFB site. Conclusions from the study process as well as final recommendations for the options were presented.

Author

Titan 4 Launch Vehicle; Ozone Depletion; Hazardous Wastes; Pollution Control; Propellants; Industrial Wastes

19970020250 General Atomics Co., San Diego, CA USA

Hydrothermal Oxidation as an Environmentally Benign Treatment Technology

Downey, K. W., General Atomics Co., USA; Hazlebeck, D. A., General Atomics Co., USA; Roberts, A. J., General Atomics Co., USA; Spritzer, M. H., General Atomics Co., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 169-171; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

General Atomics (GA) and its subcontractors are currently conducting three demonstration programs aimed at designing and building systems for the destruction of a variety of military hazardous wastes. The first program, sponsored by the Advanced Research Projects Agency (ARPA), is for the destruction of chemical agents (GB, VX, and mustard), propellants, and other Department of Defense (DOD) hazardous wastes. The second program, sponsored by the Joint Ordnance Commanders Group and the

Air Force, is for the destruction of Hazard Class 1.1 rocket propellant. The third program, also sponsored by ARPA, is for the destruction of shipboard Navy excess hazardous materials such as jet fuel, waste paints, and solvents. Destruction of these materials is performed utilizing hydrothermal oxidation (HTO), an environmentally friendly technology undergoing development by various Government, commercial, and academic institutions. Further application of HTO technology to other military wastes such as liquid propellants, process sludges, and bead blast residues from paint stripping operations is under consideration.

Author

Hazardous Wastes; Oxidation; Environment Protection; Organic Materials; Destruction; Supercritical Fluids

19970020251 Naval Surface Warfare Center, Indian Head, MD USA

Commercial-Scale Evaluation and Application of Ultraviolet/Oxidation of Wastewater from Nitroglycerin Production

Hempfling, Craig, Naval Surface Warfare Center, USA; Thomas, Bruce, Naval Surface Warfare Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 173-183; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

The Indian Head Division, Naval Surface Warfare Center evaluated the performance of two pilot-scale ultraviolet/oxidation systems for treatment of nitroglycerin production wastewater, Solarchem Environmental Systems and Peroxidation Systems, Inc. A commercial-scale system was purchased from Solarchem and its performance compared to that of the pilot-scale system using standard reaction kinetics procedures. The first-order reaction rate expression for nitroglycerin decomposition was developed for the commercial-scale Solarchem system. Studies were conducted using the commercial-scale UV/oxidation system to determine the treatment by-products from nitroglycerin decomposition. Nitroglycerin and partially nitrated derivatives of nitroglycerin, inorganic nitrates, nitrites, and ammonia, and total organic carbon analyses were conducted to determine the extent of nitroglycerin decomposition and probable by-products.

Author

Waste Water; Oxidation; Nitroglycerin; Decomposition; Ultraviolet Radiation; Water Treatment

19970020252 United Technologies Corp., Chemical Systems Div., San Jose, CA USA

Treatment of Solid Propellant Manufacturing Wastes: Base Hydrolysis as an Alternative to Open Burning

Borcherding, Ron, United Technologies Corp., USA; Wolbach, Dean, Geraghty and Miller, Inc., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 185-193; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

Chemical Systems has selected base hydrolysis treatment to replace open burning of solid propellant manufacturing wastes. This treatment approach was adapted from several technologies. Reclaim/reuse and experimental treatment technologies were combined into the selected treatment process. Adoption of this change in treatment technology requires characterization and minimization of waste streams and alternate product development. The treatment facility design and permitting are discussed. Experiments performed on three representative types of solid propellants demonstrate the process feasibility and characterize the products of the hydrolysis. The products of the propellant treatment are ammonia, hydrogen, nitrogen oxide gasses, soluble inorganic and organic salts, and insoluble polymeric and metallic materials. Materials contaminated with propellant are cleaned and separated from the hydrolysate. The products of the process will be treatable in conventional waste treatment facilities.

Author

Hydrolysis; Waste Treatment; Solid Propellants

19970020253 Naval Surface Warfare Center, Environmental Technology Branch, Indian Head, MD USA

Energetic Materials Processing Using Supercritical Carbon Dioxide

Farncomb, Robert E., Naval Surface Warfare Center, USA; Naufflett, George W., Naval Surface Warfare Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 195-204; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

A supercritical fluid extraction capability has been developed using carbon dioxide for processing energetic materials. Two modular multipurpose process development units have been constructed and supercritical fluid technology has been expanded and adopted to include the following applications: preparation of energetic polymers, preparation of pyrotechnic MTV (Magnesium, Teflon, Viton), recovery of nitrocellulose from single-base propellants as well as extraction of depleted stabilizer from and

addition of new stabilizer to such propellants; extraction of nitrate esters, oil and grease and other contaminants from process or wastewater; and scaleup of the Phasex Corporation Gas Anti-Solvent (GAS) recrystallization procedure for RDX (cyclotrimethylenetrinitramine) and HMX (cyclotetramethylenetetranitramine).

Author

Carbon Dioxide; Supercritical Fluids; Nitrate Esters; Extraction; Contaminants; Materials Recovery

19970020254 THAR Designs, Inc., Pittsburgh, PA USA

Design Considerations for Cleaning using Supercritical Fluid Technology

Chordia, Lalit M., THAR Designs, Inc., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 205; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC); Abstract Only, Hardcopy, microfiche

The interest in using supercritical fluid carbon dioxide for cleaning has increased significantly. Supercritical fluid technology employs a mobile phase (or solvent) that is a highly compressed gas near or above its critical temperature and critical pressure points. Carbon dioxide is the most widely used supercritical fluid. Supercritical carbon dioxide is a superior solvent over conventional hydrocarbons, such as hexane or methylene chloride, for cleaning because it is chemically inert, non-toxic, non-flammable, non-corrosive and relatively inexpensive. The critical temperature of carbon dioxide is 31 C and the critical pressure is 73 atmospheres. Some of the benefits of this technology is high mass transfer coefficients and elimination of hazardous solvents. The biggest challenge in the supercritical fluid cleaning business is in the equipment cost. New designs that are not only superior in performance, are relatively inexpensive to manufacture, and very simple to use are necessary for the successful commercialization of these system. Stirring the components to be cleaned or the carbon dioxide to increase the rate of cleaning is very critical. High pressure stirrers, especially for large vessels, are expensive. Magnetic stirrers are okay for small vessels, but for large vessels they tend to be bulky and expensive. Vessels with innovative 'Finger Tight' closures for quick opening and closing, threaded closures that provide additional safety during inadvertent opening, pumping system designed to account for compressibility of carbon dioxide, pressure reduction valve with seats that can withstand erosion due to the rapid expansion of carbon dioxide, and automation are some of the necessary ingredients for successful usage of this technology. Thar Designs has developed a novel designs that have not only reduced the equipment price but also provided substantial performance. Designs relating to pressure vessel stirrers, pumps, etc. will be presented. This high capital cost has negated the advantages of supercritical fluids and relegated its use to only niche applications in the food industry. Even though the applications for this technology are considerable, only a few plants exist in the world for use only for very high value items.

Author

Supercritical Fluids; Carbon Dioxide; Chemical Cleaning; Solvents; Equipment; System Effectiveness

19970020255 DEFLEX Corp., Burbank, CA USA

Centrifugal Shear Carbon Dioxide Cleaning

Jackson, David P., DEFLEX Corp., USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 207-218; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

This paper describes an emerging technology called centrifugal shear carbon dioxide (CSCD) cleaning. This new multi-phasic CO₂-based cleaning technology was developed by the DEFLEX Corporation. It provides medium to high volume parts cleaning capacity for both general and precision cleaning applications. It is a very economical and high performance alternative to organic solvents and water-based cleaning processes. CSCD cleaning is a dynamic separation process which combines dense fluid chemistry, centrifugal force and aggressive scouring action. CSCD cleaning and operating characteristics meet or exceed standards associated with banned organic solvents, semi-aqueous, and aqueous cleaning processes and do not produce air pollution, wastewater, or spent cleaning agents Applications for this new cleaning technology are diverse, ranging from degreasing hundreds of pounds of rod, bar and tubing to extracting delicate implantable medical devices.

Author

Carbon Dioxide; Centrifugal Force; Cleaning; Phase Diagrams; Physical Chemistry

19970020256 NASA Kennedy Space Center, Cocoa Beach, FL USA

Precision Cleaning Verification of Fluid Components by Air/Water Impingement and Total Carbon Analysis

Barile, Ronald G., I-NET, Inc., USA; Fogarty, Chris, I-NET, Inc., USA; Cantrell, Chris, I-NET, Inc., USA; Melton, Gregory S., NASA Kennedy Space Center, USA; Environmentally Sound Processing Technology: JANNAF Safety and Environmental

Protection Subcommittee and Propellant Development and Characterization Subcommittee Joint Workshop; Jul. 1995, pp. 219-222; In English; Also announced as 19970020234; No Copyright; Avail: Issuing Activity (CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC), Hardcopy, microfiche

NASA personnel at Kennedy Space Center's Material Science Laboratory have developed new environmentally sound precision cleaning and verification techniques for systems and components found at the center. This technology is required to replace existing methods traditionally employing CFC-113. The new patent-pending technique of precision cleaning verification is for large components of cryogenic fluid systems. These are stainless steel, sand cast valve bodies with internal surface areas ranging from 0.2 to 0.9 m(exp 2). Extrapolation of this technique to components of even larger sizes (by orders of magnitude) is planned. Currently, the verification process is completely manual. In the new technique, a high velocity, low volume water stream impacts the part to be verified. This process is referred to as Breathing Air/Water Impingement and forms the basis for the Impingement Verification System (IVS). The system is unique in that a gas stream is used to accelerate the water droplets to high speeds. Water is injected into the gas stream in a small, continuous amount. The air/water mixture is then passed through a converging-diverging nozzle where the gas is accelerated to supersonic velocities. These droplets impart sufficient energy to the precision cleaned surface to place non-volatile residue (NVR) contaminants into suspension in the water. The sample water is collected and its NVR level is determined by total organic carbon (TOC) analysis at 880 C. The TOC, in ppm carbon, is used to establish the NVR level. A correlation between the present gravimetric CFC-113 NVR and the IVS NVR is found from experimental sensitivity factors measured for various contaminants. The sensitivity has the units of ppm of carbon per mg-ft(exp 2) of contaminant. In this paper, the equipment is described and data are presented showing the development of the sensitivity factors from a test set including four NVR's impinged from witness plates of 0.05 to 0.75 m(exp 2).

Author

Cryogenic Fluids; Cleaning; Water Flow; Impingement; Carbon; Contaminants; Air Jets; Supersonic Jet Flow

19970020292 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Mobile On-Site Sample Collection, Preparation, and Analysis in Iraq Final Report, Jan. - Apr. 1995

Swahn, Irvine D., Edgewood Research Development and Engineering Center, USA; Brzezinski, Janet H., Edgewood Research Development and Engineering Center, USA; Nov. 1996; 19p; In English

Report No.(s): AD-A320507; ERDEC-TR-356; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The U.S. Army Edgewood Research, Development and Engineering Center has developed mobile on-site sample collection, preparation, and analysis equipment to collect environmental samples in highly contaminated areas. This equipment is being used by the United Nations Special Commission at the Baghdad Monitoring and Verification Center (BMVC), which provides long-term monitoring of dual-purpose chemical sites in Iraq I.E., THOSE WITH POTENTIAL FOR CHEMICAL WARFARE (CW) production. A mobile laboratory was set-up in the BMVC to prepare and analyze samples collected throughout Iraq. Automatic air samplers were installed at various sites to collect vapor samples on absorption tubes that were analyzed using a gas chromatographic (GC) flame photometric detector (FPD). Mobile sample collection kits were used to collect solid, liquid, air, and wipe samples during challenge inspections. These samples were prepared using a sample preparation kit, which concentrates CW agent, breakdown products, and their precursors in complex matrices down to sub part per million levels for chemical analysis by a GC mass selective detector (MSD). This report describes the problems and solutions encountered with setting up a self-sufficient mobile analytical laboratory. Details of the various components associated with the laboratory and the collection kits are included. The experience gained in setting up an on-site laboratory in an actual real-world situation has provided needed insight into developing future on-site laboratories.

DTIC

Air Pollution; Chemical Analysis; Air Sampling; Chemical Warfare; Contamination

19970020321 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Development of an Analytical Method for White Phosphorus (P4) in Water and Sediment Using Solid-Phase Microextraction

Walsh, Marianne E., Army Cold Regions Research and Engineering Lab., USA; Taylor, Susan, Army Cold Regions Research and Engineering Lab., USA; Thorne, Philip G., Army Cold Regions Research and Engineering Lab., USA; Aug. 1996; 19p; In English Report No.(s): AD-A317623; CRREL-SR-96-16; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Headspace Solid-Phase MicroExtraction (SPME) methods were developed for white phosphorus in water and sediment/soil to minimize waste generated by methods based on solvent extraction. Headspace SPME provided a rapid, non-exhaustive extraction, based on equilibrium, of white phosphorus. Comparison of results obtained by headspace SPME and solvent extraction shows that headspace SPME may be used quantitatively for some water matrices and qualitatively for more complex matrices

such as sediment/soil. Because detection limits appear to be similar to those obtained by solvent extraction, headspace SPME can be used to rapidly screen samples for contamination, eliminating the need to solvent-extract most samples.

DTIC

Water Pollution; SOIL Pollution; Chemical Analysis; Phosphorus

19970020332 Armstrong Lab., Environics Directorate, Tyndall AFB, FL USA

FIP: A Pattern Recognition Program for Fuel Spill Identification Final Report, Aug. 1993 - Aug 1995

Faruque, A., Armstrong Lab., USA; Lavine, B. K., Armstrong Lab., USA; Mayfield, Howard T, Armstrong Lab., USA; May 1996; 35p; In English

Report No.(s): AD-A317141; AL/EQ-TR-1996-0007; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Gas Chromatography and pattern recognition methods (GC-PR) constitute a powerful tool for investigating complex environmental problems e.g., realistically analyze large chromatographic data sets and to seek meaningful relationships between chemical constitution and source variables. Recently, our laboratory has investigated the potential of GC-PR as a method for typing fields in order to directly relate a spill sample to its source. A graphic user interface (GUI) based interactive software called FIP (fuel identification program) has been developed. The development of this software system takes advantage of the high performance computational and visualization routines of the MATLAB programming environment. Both neural networks and statistical pattern recognition techniques are implemented. FIP employs covariance stabilization of the data to ensure correct classification of the gas chromatograms of weathered and un-weathered jet fuels.

DTIC

Gas Chromatography; Computer Programs; Pattern Recognition; Jet Engine Fuels; Spilling; Graphical User Interface

19970020345 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Program for the Assessment of Background Bioaerosols in the Industrial City of Pune, India Final Report, Jun. 1995 - Jun 1996

Carlton, Hugh R., Edgewood Research Development and Engineering Center, USA; Sep. 1996; 21p; In English

Contract(s)/Grant(s): DA Proj-622384

Report No.(s): AD-A317421; ERDEC-TR-367; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Biological Systems Integration Team, Research and Technology Directorate, U.S. Army Edgewood Research, Development and Engineering Center (ERDEC), has many missions related to defense against biological aerosols. One of these is the establishment of sites inside and outside the U.S. to measure and characterize bioaerosols and to accumulate a reference database on biological backgrounds in the atmosphere. Our most completely instrumented site is at ERDEC, Aberdeen Proving Ground, MD. Other measurements are being carried out at Mace Head, Ireland, and we are working to establish a collaborative program to access data from many sites in Great Britain. A recent bonus was the application of the 'Rupee Fund' to our requirements, giving us a proposed bioaerosol monitoring site in Pune, India, at no cost to ERDEC. The Rupee Fund was set up by the U.S. State Department years ago when it could not recover money intended for a failed project in India. Instead, Indian scientists were asked to propose research projects against these funds. This report describes how the Rupee Fund is expected to provide a valuable biomonitoring site for 3-5 years, without cost, and with the author serving as the principal investigator

DTIC

Aerosols; Biological Effects; Data Bases; Activity (Biology)

46

GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19970019300 Scripps Institution of Oceanography, La Jolla, CA USA

Observations of T-Phase Arrivals at Pt Sur and Wake Island Topical Report

deGroot-Hedlin, Catherine, Scripps Institution of Oceanography, USA; Mar. 15, 1996; 17p; In English

Contract(s)/Grant(s): F19628-95-K-0011; AF Proj. DENN

Report No.(s): AD-A317358; PL-TR-96-2156; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

We have assembled a large suite of T-phase observations recorded on hydrophones located at Point Sur and Wake Island, in an attempt to understand how acoustic energy from underwater earthquakes is coupled to the sound channel and how the sound propagates from source to receiver. The events cover a wide range of locations in the North Pacific. We find that T-phases observ-

able at Point Sur are generated only in a limited number of geographical regions, the Aleutian Islands and Kodiak Island regions, south of Japan, and the southern portion of the Kuril Islands region. Too few records have been assembled to date for Wake Island to discern any pattern in the locations of observable T-phases. A Signal to noise (SNR) measure was determined for each event. We found that there was no clear pattern in the SNR vs. magnitude when all the events were examined together. We narrowed the region of study to a small cluster of events in the Andre of Island region of the Aleutian Island chain in order to eliminate variables such as source mechanism, transmission path, and event depth. For this limited data set, we found that the SNR as observed at Pt. Sur was more strongly dependent upon event magnitude, however, there was still a considerable degree of scatter. This scatter is probably due to near source effects, such as the slope of the seafloor in the region of the events.

DTIC

Seismology; Acoustic Emission; Signal to Noise Ratios; Sound Waves; Earthquakes; Receivers; Underwater Acoustics

19970019311 Texas Univ., Dept. of Geological Sciences, El Paso, TX USA

Crustal Structure in the Southwestern USA Final Report, 1 Sep. 1993 - 31 Aug. 1996

Keller, G. Randy, Texas Univ., USA; Doser, Diane L., Texas Univ., USA; Miller, Kate C., Texas Univ., USA; Aug. 1996; 15p; In English

Contract(s)/Grant(s): F49620-93-1-0511; AF Proj. 3484

Report No.(s): AD-A318459; AFOSR-96-0553TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This ASSERT grant has greatly enhanced our progress on our core project. The students supported by the ASSERT grant have regularly participated in the activities of the core grant. In particular, the DEEP PROBE and DELTA FORCE projects described below provided a life experience to these students who received an opportunity to travel and to participate in a major international scientific endeavor. This seismic field experiment was ambitious and has produced a large amount of interesting data. Through both the ASSERT and core grants, the University of Texas at El Paso (UTEP) geophysics group has been conducting a wide variety of geophysical studies in the southwestern U.S. The objectives of this project are to investigate lithospheric structure and seismic wave propagation in the area. This final year of the ASSERT effort project has been very active with the successful completion of DEEP PROBE seismic field project and continued progress on our efforts to obtain a good overall view of the geophysical properties of the region. Specific efforts are discussed below.

DTIC

Wave Propagation; Geophysics; Crusts; Seismic Waves

19970019348 Instituto Nacional de Pesquisas Espaciais, ,Sao Jose dos Campos Brazil

Parameterization of Atmospheric Radiation in the CPTEC/COLA Atmospheric General Circulation Model

Chagas, Julio Cesar Santos, Instituto Nacional de Pesquisas Espaciais, Brazil; Tarasova, Tatiana Aleksandrovna, Instituto Nacional de Pesquisas Espaciais, Brazil; 1996; 150p; In English

Report No.(s): INPE-5980-NTC/327; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

Atmospheric general circulation models (AGCM) are based on the primitive equations of motion and have mathematical representations of the physical processes including the solar and thermal radiation absorption inside the atmosphere and at the Earth's surface. It is well known nowadays that physical processes have a significant impact on the climate characteristics. The parameterization of the radiative transfer in the large-scale numerical models is needed for two reasons (Morcrette): radiative transfer occurs at scales much smaller than the scales explicitly resolved by the adiabatic part of the AGCM prognostic equations; and the radiative transfer equation is too complicated to be used in a numerical weather prediction (NWP) model directly. What one looks for in a AGCM radiation parameterization is a method as simple, accurate and fast as possible for calculating the atmospheric radiation in terms of parameters supplied by the model (Stephens). The total radiative fluxes at the surface, used for the computation of the energy balance, and the vertical and horizontal radiative flux divergence, needed for the computation of the radiative heating rate of an atmospheric volume, must be obtained as output results of the radiative scheme run. This document is aimed at presenting a description of the atmospheric radiation parameterizations in the AGCM used at CPTEC now (version 1.0 CPTEC/COLA). It results from an effort to understand the scientific basis and the operation of a set of routines originally developed by Harshvardhan et al. and incorporated later by Sato et al. and Hou at the Center for Ocean-Land-Atmosphere Studies (COLA) AGCM, that was brought to CPTEC later on. As a result of a process of opening a blackbox (trying to understand and to describe details of something built by someone else) some questions or doubts will not be answered sometimes. Nevertheless, it's hoped that two main objectives have been fulfilled: the description of the parameterization scheme and the creation of basic conditions for future necessary and opportune changes in it, aiming at to improve the AGCM performance in NWP as well as in climatic simulations.

Derived from text

Atmospheric General Circulation Models; Atmospheric Radiation; Numerical Weather Forecasting; Parameterization; Equations of Motion; Radiative Transfer; Air Water Interactions

19970019385 Institute for Petroleum Research and Geophysics, Holon, Israel

Discrimination of Seismic Sources Using Israel Seismic Network *Topical Report*

Gitterman, Yefim, Institute for Petroleum Research and Geophysics, Israel; Pinsky, Vladimir, Institute for Petroleum Research and Geophysics, Israel; Shapira, Avi, Institute for Petroleum Research and Geophysics, Israel; Jul. 1996; 97p; In English
Contract(s)/Grant(s): F19628-95-K-0006

Report No.(s): AD-A317385; 555/53/96(4); PL-TR-96-2207; No Copyright; Avail: CASI; A05, Hardcopy; A02, microfiche

Regional Densed Seismic Networks (RDSN) have additional as yet uninvestigated potential for discriminating weak local earthquakes and quarry blasts. Even conventional single station discriminants, such as P/S and spectral ratios are significantly improved, after averaging across the Israel Seismic Network, which consists of 36 short period stations. This report documents a study aimed at the development of new techniques specially designed for RDSN oriented discrimination: (1) subnet average of the seismic energy ratio between the low (1-6 Hz) and high (6-11 Hz) frequency ranges; (2) spectral semblance, measuring subnet spectral shapes coherency; and (3) velogram analysis evaluating the different kinematic features of seismic waves for shallow and deep events. The algorithms were tested on 212 events: earthquakes, quarry ripple-fired and single blasts, and underwater explosions from some areas of the Middle East region with a 97-100% success rate. The study of this physically approved algorithms was complimented by testing of the multivariate procedures based on formal Integrative Approach: King's clustering procedure, Linear Discrimination Function and Artificial Neural Networks. When applied to a vector of spectral parameters derived from the Galilee data base, they provided 99-100% of true classification in a cross-validation test. All the procedures are applicable to routine processing of seismograms, thus significantly improving discrimination performance.

DTIC

Earthquakes; Underwater Explosions; Algorithms; Discriminant Analysis (Statistics); Middle East

19970019386 Saint Louis Univ., Dept. of Earth and Atmospheric Sciences, MO USA

Seismic Attenuation Studies in the Middle East and Southern Asia *Topical Report*

Mitchell, Brian J., Saint Louis Univ., USA; Cong, Lianli, Saint Louis Univ., USA; Xie, Jiakang, Saint Louis Univ., USA; Jul. 19, 1996; 53p; In English

Contract(s)/Grant(s): F19628-95-K-0004

Report No.(s): AD-A317387; PL-TR-96-2154; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

Previous research has indicated that the Middle East and southern Asia are characterized by high attenuation that may be caused by high intrinsic absorption, scattering by complex velocity structure, or both. We are trying to model these attenuative properties by measuring the attenuation of Lg coda waves as well as fundamental-mode surface waves in that region. Determinations of Lg coda Q there have allowed us to complete our map of Lg coda Q for all of Eurasia. Initial determinations of fundamental-mode Rayleigh and Love wave attenuation, using a two-station method indicate that attenuation for those waves, especially at short periods, is very high. This suggests that Q in the upper crust is very low, a result that is consistent with our Lg coda Q results. A new code has been developed for measuring dispersion and polarization properties of surface waves. Initial tests with code indicate that surface wave propagation in the Middle East is often complex and marked by lateral refraction and mode conversion along the paths of propagation.

DTIC

Wave Attenuation; Seismology; Surface Waves; Love Waves; Rayleigh Waves

19970019539 Cornell Univ., Inst. for the Study of the Continents, Ithaca, NY USA

Digital Database Development and Seismic Characterization and Calibration for the Middle East and North Africa

Barazangi, Muawia, Cornell Univ., USA; Seber, Dogan, Cornell Univ., USA; Sandvol, Eric, Cornell Univ., USA; Vallve, Marisa, Cornell Univ., USA; Jul. 31, 1996; 81p; In English

Contract(s)/Grant(s): F19628-95-C-0092

Report No.(s): AD-A317242; PL-TR-96-2222; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

It is essential for the CTBT monitoring efforts that multidisciplinary information on any given region is readily available and accessible in a digital, on-line format via electronic networks for use by concerned researchers and decision makers. Our objective is to collect and organize all available seismological, geophysical, and geological data sets for the Middle East and North Africa into a comprehensive Geographic Information System (GIS). In addition, we are producing original results, such as crustal structure beneath available broadband seismic stations, in areas where there is no available information. We are distributing the organized databases in ArcInfo GIS format and menu driven access tools and with a specially designed World Wide Web (WWW) server. Among the already collected digital data sets are detailed Moho and basement maps for the Middle East region, seismicity catalogs, focal mechanisms, and tectonic fault maps, mine locations, and various types of geophysics/geologic/geographic data for the region. We have also developed metadata to document the resolution and accuracy of the already organized data sets. The

developed organized system and its efficiency in using and updating it will help Comprehensive Test Ban Treaty (CTBT) researchers and decision makers to reach a conclusion in a very short time, including analyses of special (suspect) events and On Site Inspection efforts. Our World Wide Web address for data distribution is <http://atlas.geo.cornell.edu>.

DTIC

Data Bases; Digital Data; Seismology

19970019710 Texas Univ., Dept. of Geological Sciences, El Paso, TX USA

Development of a Lithospheric Model and Geophysical Data Base for North Africa *Topical Report*

Doser, D. I., Texas Univ., USA; Keller, G. R., Texas Univ., USA; Harder, S., Texas Univ., USA; Miller, K. C., Texas Univ., USA; Jul. 19, 1996; 45p; In English

Contract(s)/Grant(s): F19628-95-C-0104; AF Proj. DENN

Report No.(s): AD-A317610; PL-TR-96-2174; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

We have collected seismic, geologic, gravity and other potential field data to develop a model of the North African lithosphere via an integrated approach. We have constructed a gravity data base for the region, including over 5300 gravity readings for northern Libya. We have generated a Bouguer gravity map of northern Africa and are currently modeling gravity data along three transects across North Africa. These results were used as the basis on which to construct a preliminary map of crustal thickness for the region. The maps and interpreted transects are available through a World Wide Web site, and the gravity data base can also be accessed electronically. We have begun a collection of seismograms from Worldwide Standardized Seismograph Network stations located at regional distances from magnitude greater than 5.0 earthquakes occurring within North Africa (between 1963 and 1988) and their associated aftershocks. We have collected delay time, travel time, focal mechanisms, focal depth and magnitude information for these sequences for further analysis. At present, these data are being compiled into a database available on floppy diskette, but will eventually be transferred to a World Wide Web site.

DTIC

Lithosphere; Data Bases; Africa; Systems Engineering; Geophysics

19970019725 California Univ., San Diego, Inst. of Geophysics and Planetary Physics, La Jolla, CA USA

Regional Small-Event Identification Using Seismic Networks and Arrays *Topical Report*

Hedlin, Michael, California Univ., San Diego, USA; Vernon, Frank, California Univ., San Diego, USA; Minster, J. B., California Univ., San Diego, USA; Orcutt, John, California Univ., San Diego, USA; Jul. 15, 1996; 41p; In English

Contract(s)/Grant(s): F19628-95-K-OO12; AF Proj. 5101

Report No.(s): AD-A319766; PL-TR-96-2173; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Comprehensive Test Ban Treaty (CTBT) negotiations have endowed small seismo/acoustic events (mb 2.5) with a much greater significance than they have had in the past and have increased the need for automated regional discrimination. We have been contracted by AFTAC to develop a small event discriminant that uses a time frequency expansion (sonogram) of seismic coda to discriminate ripple fired mining explosions from single explosions and earthquakes. The Automated Time Frequency Discriminant (ATFD) which we have developed uses a binary sonogram which is derived from the original, spectral, sonogram by the application of filters which replace the spectral information with a binary code which simply reflects local spectral highs and lows. We have found that the binary patterns which we extract from the coda of ripple-fired events are banded and thus distinct from those obtained from single explosions and earthquakes. The bands, which result from source finiteness, intershot delays or a combination of the two, are largely independent of time and of the recording component. The ATFD uses three statistical tests to measure the time and recording component independence and automatically recognize these bands. All of the raw discrimination parameters produced by these tests are merged into a single discriminant score with multivariate statistics.

DTIC

Seismology; Time Dependence; Networks

19970019735 Phillips Lab., Hanscom AFB, MA USA

Data Report for the 1995 Wind River Mountains - Green River Basin Seismic Refraction Profile *Interim Report*

Koester, Stephan H., Phillips Lab., USA; Cipar, John J., Phillips Lab., USA; May 23, 1996; 24p; In English

Contract(s)/Grant(s): AF Proj. 2309

Report No.(s): AD-A317484; PL-TR-96-2093; ERP-1191; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

During August, 1995, the Earth Sciences Division of Phillips Laboratory (PL/GPE) recorded a seismic refraction profile across the Wind River Mountains and adjacent Green River Basin using controlled explosions fired east of Lander, Wyoming, as part of the Deep Probe experiment. The Deep Probe Experiment was an ultra-large scale active seismic profile carried out by several US and Canadian universities and the Canadian Geological Survey with the goal of imaging the upper mantle of western

North America. The main Deep Probe profile was oriented north-south from Edmonton, Alberta, to Crownpoint, New Mexico, a distance of 1900 km. An intermediate shot point was located approximately 50 km east of Lander, Wyoming, and provided the sources for the seismic profile described in this report. The PL/GPE profile consisted of 47 shot-station points extending from Big Sandy, Wyoming, west to the Idaho-Wyoming border, a distance of 150 km.

DTIC

Seismology; Data Acquisition; Earth Sciences; Earth Crust; Geological Surveys

19970019738 Saint Louis Univ., Dept. of Earth and Atmospheric Sciences, MO USA

Seismic Wavefield Calibration Topical Report

Herrmann, R. B., Saint Louis Univ., USA; Jun. 28, 1996; 44p; In English

Contract(s)/Grant(s): F19628-95-K-0005; AF Proj. DENN

Report No.(s): AD-A317759; PL-TR-96-2189; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The use of regionally recorded Rayleigh waves to estimate isotropic moment and ψ -infinity for the purpose of yield estimation is investigated. These seismological parameters and their variability are consistent with other investigations. ψ -infinity shows less variability than isotropic moment as a yield estimator. Preliminary results on wave propagation in the Korean peninsula are also presented.

DTIC

Wave Propagation; Seismology; Rayleigh Waves; Isotropy; Calibrating

19970020211 Science Applications International Corp., San Diego, CA USA

Regional Attenuation at GSETT-3 Stations and the Transportability of the Lg/P Discriminant Topical Report No. 1

Jenkins, Richard D., Science Applications International Corp., USA; Velasco, Aaron A., Science Applications International Corp., USA; Williams, Donna J., Science Applications International Corp., USA; Sereno, Thomas J., Jr, Science Applications International Corp., USA; Jul. 15, 1996; 42p; In English

Contract(s)/Grant(s): F19628-95-C-0097; AF Proj. DENN

Report No.(s): AD-A317380; SAIC-96/1137; PL-TR-96-2159; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Recent studies have shown that the high-frequency Lg/P ratio can be an effective discriminant at regional distances. However, this ratio must be recalibrated for each new source region. We are developing regional wave attenuation models for up to 10 sub-networks of the International Data center (IDC) primary network, and will use them to evaluate the transportability of the Lg/P discriminant to uncalibrated regions. We are measuring amplitudes of regional phases in the time and frequency domain, and using our new software program, AmpInv, to invert for source and attenuation models. During the first year of this two-year project we developed all software needed for this study, investigated alternative amplitude measures, and compiled a data set for an Australian sub-network. During the second year we will compile the data sets for the other IDC sub-networks, estimate regional wave attenuation using AmpInv, and evaluate the accuracy and transportability of the Lg/P discriminant. We will also obtain 'ground-truth' identification for as many of the events as possible, and we will use knowledge of the local natural and industrial seismicity when this information is not available.

DTIC

Attenuation; Wave Attenuation; Seismology; Discriminant Analysis (Statistics); Seismic Waves

19970020290 Colorado Univ., Inst. of Behavioral Science, Boulder, CO USA

Natural Hazards Observer, Volume 21

Dane, Sylvia C., Editor, Colorado Univ., USA; Nov. 1996; ISSN 0737-5425; 25p; In English

Report No.(s): AD-A317673; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The July 1996 issue of the Natural Hazards Observer (p. 10) noted the formal announcement -of the new National Earthquake Loss Reduction Program (NEP). This new program builds upon-but does not supplant-the National Earthquake Hazards Reduction Program (NEHRP), which is legislated by Congress. Since the formal announcement, several significant events have transpired. The Federal Emergency Management Agency (FEMA), which has 'lead agency' responsibility for the NEHRP and the NEP, has created a National Earthquake Program Office as part of its Mitigation Directorate. The NEP office director reports directly to the associate director for mitigation. In June, the NEP agencies held a two-day retreat at the National Institute of Standards and Technology in - Gaithersburg, Maryland, to begin strategic planning. This effort builds on the Office of Science and Technology Policy report that recommended establishment of the NEP, as well as other reviews of the NEHRP in the past several years. The group drafted goals for the NEP and two sets of objectives; one for the NEP office and one for the NEP as a whole. The agen-

cies reconvened in early October to consider the results of these efforts. Soon, the proposed goals and objectives will be shared for comment by the many nonfederal groups interested in - earthquake hazards reduction.

DTIC

Hazards; Management Planning; Earthquakes

19970020313 Monterey Bay Aquarium Research Inst., Moss Landing, CA USA

Slope Failure, Tectonics, and Gas and Fluid Expulsion on the Southern Cascadia Continental Shelf and Slope: Effects on Seafloor Geomorphology *Interim Report, 1 Jan. - 14 Oct. 1996*

Orange, Daniel L., Monterey Bay Aquarium Research Inst., USA; Oct. 14, 1996; 7p; In English

Contract(s)/Grant(s): N0001496-I-0361

Report No.(s): AD-A320396; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

The objective of this project is to evaluate the role of fluid flow, overpressuring, and gas migration in the creation of failure features on the seafloor of a tectonically active continental margin. This project addresses questions about the lateral and vertical extent of detectable gas and gas-related structures in the subsurface, the regional distribution of failure features, the locations of overpressured fluids in the subsurface, and how the structural geology of this region affects the locations of gas and fluid migration pathways and expulsion sites. We pursue answers to these questions using a combination of theoretical and observational analyses. Observations and hypotheses based upon remote sensing techniques (industry-quality multichannel seismic, high resolution multichannel seismic, high resolution single channel seismic, acoustic reflectivity, high resolution sidescan, high resolution bathymetry) will be ground-truthed with direct observation and sampling via use of a remote operated vehicle (ROV). These observations will become the basis for modeling the relationship between gas-charged fluids and slope failure. Fulfillment of these objectives will allow us to obtain a better understanding of the dynamic processes occurring on the southern Cascadia continental shelf and slope, and ultimately help address how sediment is transported from the shelf to upper slope, and from the upper slope to abyssal depths.

DTIC

Ocean Bottom; Fluid Flow; Remote Sensing; Slopes; Tectonics; Geomorphology

19970020322 Army Research Lab., Battlefield Environment Directorate, White Sands Missile Range, NM USA

Optical Turbulence at Kitt Peak National Observatory, Fred Whipple Observatory, Apache Point Observatory, Horace Mesa, and the Atmospheric Profiler Research Facility *Final Report*

Drexler, Frank J., Lockheed Engineering and Sciences Co., USA; Hines, John R., Lockheed Engineering and Sciences Co., USA; Eaton, Frank D., Army Research Lab., USA; Hines, John R., Army Research Lab., USA; Jun. 1996; 111p; In English

Report No.(s): AD-A315342; ARL-TR-1013; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The transverse coherence length $r_{sub 0}$ derived from differential image motion of stellar sources, was measured at three astronomical sites (Kitt Peak National Observatory, Fred Whipple Observatory, and Apache Point Observatory), a high mesa (Horace Mesa), and in a desert basin (Atmospheric Profiler Research Facility) at White Sands Missile Range. Composite results of $r_{sub 0}$ on the order of a few minutes are seen under convectively unstable conditions. The quiescent periods, neutral events, when local near surface adiabatic conditions occur, show substantial reductions in the fluctuations of the same quantity. Image motion results for night (stable) conditions display slowing and varying patterns with reduced short term (few minutes) variations. Measurements were taken using a suite of instrumentation probing the same volume of atmosphere. The instrumentation includes the Atmospheric Turbulence Measurement and Observation System, a sodar, a scintillometer, and tower mounted sensors. A time height display of sodar data, calibrated for the refractive index structure parameter, $C(sub n)(sup 2)$ coupled with scintillometer measurements show the diurnal evolution of the boundary layer responding to the local heating cooling cycle and drainage flows from surrounding mountains. Several atmospheric features are seen and discussed in the results because they affect the nature of the patterns of $r(sub 0)$. of particular interest are the development of convection, changes in the capping inversion, thermal plume structures, neutral events, and wave turbulence interactions. Sinusoidal oscillations, identified as internal gravity waves, are seen in the night laminated structures.

DTIC

Atmospheric Turbulence; Astronomical Observatories; Temperature Distribution

19970020353 California Univ., Div. of Statistics, Davis, CA USA

Array Detection of Ripple-Fired Signals: The Cepstral F-Statistic *Topical Report*

Shumway, Robert H., California Univ., USA; Sep. 30, 1996; 34p; In English

Contract(s)/Grant(s): F19628-95-K-0010; AF Proj. 5101

Report No.(s): AD-A319833; TR-326; PL-TR-96-2253; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Time and frequency domain approaches to detecting a consistent pattern of reflections on an ensemble of seismic recordings are developed. Such patterns are characteristic of mining bursts and not of nuclear explosions or earthquakes so that detecting a ripple delay structure can serve as one component for discrimination. In the frequency domain approach, a generalization of cepstral analysis is used to derive an F-Statistic for detecting delay-fired events. Detrended log spectra are considered as realizations of a stationary process whose periodic components are quefrequencies, with periods proportional to delay time differences. An F-Statistic is derived that is proportional to the stacked cepstrum and the spectrum of the stacked log spectra. Advantages of the cepstral F-Statistic accrue from better resolution and the fact that statistical significance can be established for delay peaks. It is also easily incorporated into automatic detection systems. The frequency domain approach is compared to a time domain approach that involves searching seasonal autoregressive models with a fixed regular delay structure. Simulated array data and data from a number of mining explosions, measured at ARCESS, are analyzed by both approaches.

DTIC

Underground Explosions; Mathematical Models; Mines (Excavations); Cepstral Analysis; Frequencies

19970020356 Lamont-Doherty Geological Observatory, Palisades, NY USA

Characterization of Seismic Source and Path in Central Eurasia Using Digital Seismograms from Borovoye Observatory, Northern Kazakhstan Final Report, 1 Sep. 1992 - 31 Aug. 1995

Kim, Won-Young, Lamont-Doherty Geological Observatory, USA; Richards, Paul G., Lamont-Doherty Geological Observatory, USA; Feb. 04, 1996; 76p; In English

Contract(s)/Grant(s): F49620-92-J-0479

Report No.(s): AD-A319817; AFOSR-TR-97-0015; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

This final report is in three sections: (1) Describes RMS Lg measurement for five Chinese nuclear explosions at Lop Nor recorded digitally at Borovoye, Kazakhstan (station BRVK). The regression shows scatter only a 0.045 magnitude units against ISC mb(P). (2) Summarizes a new method to determine the response of digital seismographs from their transient calibration pulses by iterative inverse technique. The method is use to derive complete instrument responses for STsR-TSG system at BRVK. (3) Describes a major survey of regional seismic data for explosions at the Semipalatinsk test site, that has documented the occurrence of 18 small nuclear explosions at Degelen (since confirmed), not previously described in the open literature. A new PC based system is installed at Borovoye Geophysical Observatory, Kazakhstan for archive tape copying and about 100 raw tape copies have been transferred to LDEO. Part of the digital waveform data have been reformatted and submitted to the IRIS-DMC for interested scientists.

DTIC

Seismology; Nuclear Explosions; Digital Data

19970020393 Instituto Nacional de Pesacais Espaciais, Sao Jose dos Campos, Brazil

Ionospheric Model at Low Latitudes in Brazil Final Report Modelo Ionosferico em Baixas Latitudes no Brasil

Cottini, Leticia Teixeira, Instituto Nacional de Pesacais Espaciais, Brazil; Batista, Inez Staciarini, Instituto Nacional de Pesacais Espaciais, Brazil; Feb. 1997; 80p; In Portuguese; Translated into English by Schreiber Translations

Report No.(s): INPE-6138-PRP/201; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

Electronic density is a very important parameter for geophysical studies and for transionospheric telecommunications. The previous knowledge of the electronic density is useful in Several applications such as: radio-astronomy, space geodesy and navigation of satellites and space vehicles. The Global Positioning System systems that are being amply utilized in the most diverse applications, require a precise ionospheric model in order to produce highly reliable results. The global ionospheric models, such as the International Reference Ionosphere, are not appropriate to represent the ionospheric electronic density in the region beinsided. Thus, the objective of this study is to create an ionospheric model to forecast the ionosphere behavior at low latitudes in the Brazilian region.

Derived from text

Ionospheric Propagation; Atmospheric Models; Latitude; Global Positioning System

19970019347 Instituto Nacional de Pesacais Espaciais, Div. de Processamento de Imagens, Sao Jose dos Campos, Brazil

Restoration of NOAA Images with Mathematical Morphology Restauracao de Imagens NOAA por Morfologia Matematica

Banon, Gerald Jean Francis, Instituto Nacional de Pesquisas Espaciais, Brazil; Candeias, Ana Lucia, Instituto Nacional de Pesquisas Espaciais, Brazil; 1997; 11p; In Portuguese

Contract(s)/Grant(s): CNPq-300966/90-3; FAPESP-91/3532-2

Report No.(s): INPE-6132-PRE/2232; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The striping effect on NOAA images can be reduced by using the Mathematical Morphology tools. At the first stage, the corrupted pixels are localized, and, at the second stage, their values are interpolated from the uncorrupted neighboring pixel values. The implemented algorithm uses the Mathematical Morphology Toolbox for the K-HOROS system.

Author

Image Reconstruction; Satellite Imagery; Algorithms

19970019395 Colorado State Univ., Fort Collins, CO USA

On the Causes of Tropical Cyclone Motion and Propagation

McElroy, Carl A., Colorado State Univ., USA; Jan. 09, 1997; 144p; In English

Report No.(s): AD-A319898; CSU-96-135; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The physics of tropical cyclone (TC) motion and propagation are examined using both climatological and composite rawinsonde data. Propagation is defined as TC motion relative to its surrounding steering flow. Tropical cyclones are observed to move 1-2 ms to the minus first power faster and usually 10-20 deg to the left of the surrounding deep layer steering current (850-300mb deep layer flow averaged through a 5-7 deg radial band). Tropical cyclones move in response to a deep tropospheric current which advects them after they form. The primary factor causing TCs to propagate faster than their steering flow is their formation and continued residence within a baroclinic environment. This baroclinic environment is evidenced by positive and negative tropospheric wind shears on opposite sides of the storm track. The presence of this wind shear on each side of the storm track causes a deep layer wind profile with the weakest flow away from the storm center. Hence, the TC center is embedded in the strongest tropospheric mean flow. The deep layer parallel wind flow to each side of the TC in the (MOT) frame of reference must, as a consequence of the temperature gradient induced wind shears, be weaker than the deep layer flow over the TC center. Tropical cyclones are situated in the warmest part of the environment with a cooler deep layer current to both right and left sides. These deep layer flow properties are applicable to the vicinity of the TC regardless of latitude or direction of motion. Most TCs propagate to the left of their steering flow because they move from a relatively warm environment to a relatively cool environment. Westward moving TCs in the Atlantic are the exception. These are a special class of TCs which move from a relatively cool to a relatively warm environment. In this case, rear (cold) to front (warm) relative environmental temperatures cause a right deviation from the steering flow.

DTIC

Cyclones; Atmospheric Circulation; Climatology; Tropical Storms; Flow Characteristics; Wind Shear

19970019497 Utah Univ., Salt Lake City, UT USA

The Role of Radiative Processes in the Tropical Intraseasonal Oscillation

Johnson, Michael W., Utah Univ., USA; Jan. 09, 1997; 129p; In English

Report No.(s): AD-A319909; AFIT-96-35D; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The tropical 30-60 day oscillation (Intraseasonal Oscillation - IO) is a topic of contemporary interest and a unified theory as to how it is created, why it behaves so erratically, and what is the mode of propagation does not exist. Theories and observational studies have emphasized the role of tropical convection in the Western Pacific Ocean with less attention paid to the role of radiative cooling in the area of the downward branch of the Walker circulation. This research focuses on that area (the tropical Eastern Pacific Ocean) where it is hypothesized that radiative cooling interacts with IO-circulations. Analysis is made in terms of calculated radiative heating fields and Kelvin winds (used as a proxy for IO-circulations). Radiative heating is calculated for seventeen pressure levels (1000-100 mb) for a 6 1/2 year period (1985 to mid-1991) at a 5-day frequency based on NCEP/NCAR gridded data and ISCCP/CI clouds. Concurrently, normal mode projections of NCEP/NCAR gridded data are made to isolate the Kelvin mode response in the wind and height field. These calculated radiative heating and Kelvin winds are then spectrally filtered to isolate frequencies associated with the IO. Finally, a diagnostic analysis is made based on composite comparisons, lagged correlations, and a selected case study between filtered-Kelvin-winds and filtered-radiative-cooling. The analysis reveal three primary conclusions. First, there is a significant relationship between IO-circulations and IO-scale radiative heating in the Eastern Pacific Ocean. Second, this relationship exhibits both a remote scale spanning the entire Pacific and a local scale unique to the Eastern Pacific. Third, the radiative heating signal precedes the upstream response in the Kelvin wind by 5 to 10 days.

DTIC

Radiative Transfer; Tropical Regions; Annual Variations

19970019530 Montana State Coll., Coll. of Graduate Studies, Bozeman, MT USA

Workshop on Future Directions in Snow and Ice Research Final Report, Jan. 1995 - Jul. 1996

Brown, Robert L., Montana State Coll., USA; Sep. 01, 1996; 16p; In English, 3-6 Oct. 1995, Bozeman, MT, USA

Contract(s)/Grant(s): DAAH04-94-G-0427

Report No.(s): AD-A316355; ARO-33621.1-GS-CF; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

This project was undertaken to define the important unresolved issues involving snow and ice. The Terrestrial Sciences Program directed by Dr. Russell Harmon at the Army research Office has as one of its responsibilities the funding of research that will advance knowledge about snow and ice mechanics. In 1981 a workshop involving the properties of snow was sponsored jointly by NSF and ARO to determine the important unresolved problems. This workshop sponsored by this grant is the first since that time to again discuss the current state-of-the-art and to ask what are the important unresolved problems. The workshop was held October 3-6 1995 at the 320 Ranch near Bozeman, Montana and was divided into two parts, one to discuss ice and the other to address issues involving snow. The ice session was chaired by Dr. Erland Schulson of Dartmouth College, and the snow session was chaired by Dr. Robert L. Brown of Montana State University. Approximately 45 leading scientists and engineers from the USA and six other countries participated in the workshop. The findings were presented in a workshop report.

DTIC

Ice; Snow; Conferences

19970019561 North Carolina State Univ., Raleigh, NC USA

A Climatology of Mesoscale Wave Disturbances Seen in Mesonet Data During Storm-Fest

Siedlarz, Leanne M., North Carolina State Univ., USA; Jan. 09, 1997; 214p; In English

Report No.(s): AD-A320430; AFIT-96-140; No Copyright; Avail: CASI; A10, Hardcopy; A03, microfiche

Many studies have found mesoscale gravity waves to be the likely trigger in severe weather outbreaks. In order to better recognize a gravity wave as such and move towards predicting an event and the weather changes associated with it, we must increase our basic knowledge of these waves by answering questions on their frequency of occurrence, typical magnitude and the conditions under which they occur. This study is an effort to do just that by examining the mesoscale surface data collected during the STORM-Fronts Experiment System Test, STORM-FEST experiment performed by the US Weather Research Program in the central US from 1 February through 15 March 1992. Thirteen pressure pulse events (amplitude greater than or equal to 0.2 mb, period 1-6 hrs) were identified in the surface pressure data gathered during STORM-FEST, involving 34% of the total hours investigated. These events were ranked according to their average amplitude. The three top-ranked events were analyzed in detail and all three of the events displayed evidence of a gravity wave in the high perturbation pressure wind covariances and in the continuity of the wave signatures. A variety of wave types were evident in each of the cases, including wavelets, wave trains and waves of elevation and depression.

DTIC

Mesoscale Phenomena; Gravity Waves; Cyclogenesis; Pressure Pulses; Atmospheric Pressure; Climatology

19970019587 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Determination of Frontal Structure in the Mid-Atlantic Region from WSR-88D Doppler Radar Velocity Azimuth Displays

Krogh, Tony C., Air Force Inst. of Tech., USA; Jan. 09, 1997; 76p; In English

Report No.(s): AD-A320422; AFIT-96-142; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

This research develops a technique for using the WSR-88D Doppler Radar to study cold air damming events in the mid-Atlantic region. of particular use is the Velocity-Azimuth Display Wind Profile (VWP), which is a time-height plot of horizontal winds above the radar at approx. 300 m intervals. VWPs were gathered from seven stations across the region for this study. A thermal retrieval technique is employed using the vertical wind shears obtained from VWPs, along with the thermal wind equation, to retrieve the horizontal thermal gradients $\partial(r) T$ and the associated horizontal thermal advections. VWP winds are height referenced, so the rawinsonde stations are used for conversion to pressure coordinates. Multiple height map analyses of thermal fields are constructed as well as single station time-height analyses of temperature gradients, thermal advections, and isentropes. Several methods were explored for the recovery of the horizontal temperature field from the $\partial(r) T$ -wind relationship. The retrieval technique is applied to two cold air damming events: December 18-19, 1995 and January 6-7, 1996. Both of these events were major winter storms for the east coast of the USA. The resulting thermal fields are verified by comparing them with surface analyses, NWS upper air analyses, and mesoscale model initial analyses and forecast fields. The comparisons of the retrieved thermal fields with currently available products was good, and shows the technique to be of use.

DTIC

Meteorology; Wind Shear; Doppler Radar; Weather Forecasting; Temperature Gradients; Upper Atmosphere; Wind Profiles; Storms

19970019610 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

Understanding and Forecasting Tropical Cyclone Intensity Change Final Report, 1 Jun. 1993 - 31 May 1996

Fitzpatrick, Patrick J., Colorado State Univ., USA; Gray, William M., Colorado State Univ., USA; Mar. 1996; 368p; In English
Contract(s)/Grant(s): F49620-93-I-0415; N00014-91-J-1092; AF Proj. 3484

Report No.(s): AD-A316812; AFOSR-TR-96-0539; No Copyright; Avail: CASI; A16, Hardcopy; A03, microfiche

This research investigates several issues pertaining to tropical cyclone intensity change. Previous research on tropical cyclone intensity change is reviewed in great detail. The applicability of upper-level forcing theories is questioned.

DTIC

Forecasting; Tropical Storms

19970019646 Texas A&M Univ., College Station, TX USA

A Climatology of Tropical Synoptical Scale Behavior From Tovs-Estimated Precipitable Water

Mackey, Morgan D., Texas A&M Univ., USA; Jan. 09, 1997; 290p; In English

Report No.(s): AD-A320428; AFIT-96-147; No Copyright; Avail: CASI; A13, Hardcopy; A03, microfiche

Tropical synoptical scale behavior is examined using 3 to 8 day filtered precipitable water (PW) estimated from TOVS operational satellite observations for 24 three-month seasons. Zonally-oriented tropical convergence zones and regions of enhanced synoptic variance are quantified and found to be poorly correlated with each other. Time-longitude plots (Hovmöller format) identify spatially coherent PW anomalies that can often be tracked around the globe. The strongest and most consistent signal is of eastward propagation across northern hemisphere Africa. Other regions demonstrate both eastward or westward propagation according to season and location. A general shift from eastward to westward propagation occurs between 20 deg and 30 deg latitude in each hemisphere. Hovmöller composites suggest an additional eastward propagating mode between 5 deg N and 12.5 deg N during SON across the entire Pacific Ocean. Seven tropical regions are chosen to perform climatological studies of synoptical scale behavior. Hovmöller composites reveal 10 m/s westward propagation across the North Atlantic (zonal wavelength is 6,000 km) and 7 m/s eastward propagation over Sahel Africa (zonal wavelength is 2,500-3,000 km). Composites over the southern Indian Ocean suggest westward motion, while propagation in the ITCZ, SPCZ, west Pacific warm pool, and Amazon basin shows little preference of zonal direction.

DTIC

Weather Forecasting; Precipitation (Meteorology); Tropical Regions; Climatology; Synoptic Meteorology; Satellite Observation; Water Vapor; Atmospheric Sounding; Ocean Surface

19970019696 Hawaii Univ., Dept. of Meteorology, Honolulu, HI USA

The Interaction Between Downslope Flow and Trade-Wind Showers Over The Island of Hawaii During 7-8 August, 1990

Frye, Jeffrey L., Hawaii Univ., USA; Aug. 1996; 105p; In English

Report No.(s): AD-A319129; AFIT-96-064; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

Data from the Hawaiian Rainband Project (HaRP) are used to study the interaction between downslope flow and trade-wind showers over windward sections of the island of Hawaii on 7-8 August 1990. Large-scale conditions produce strong upstream trade-winds of 11 m s⁻¹ which are among the strongest observed during HaRP. In addition, frequent trade-wind showers are responsible for the largest precipitation accumulation between 0300-0700 HST over windward Hawaii during HaRP. The evolution of downslope flow and its interaction with the trade-wind showers under these conditions will be studied in detail. The initiation of downslope flow occurs under dry conditions on the upper slopes by radiative cooling, and then progresses downslope until it arrives over windward lowlands. Here the downslope flow transition is held up by the strong trade winds occurring at the coast. Downslope flow is finally observed over the coast only after a band of rainshowers produces evaporative cooling allowing downslope winds to extend offshore. The evolution of downslope flow afterwards is affected by rainshowers. Vertical mixing associated with rainshowers transports trade-wind momentum into the weak downslope flow layer, replacing westerly winds with strong easterly winds. At the surface, a clear increase in temperature and moist static energy is observed as potentially warmer air aloft mixes with the surface layer. This temporary destruction of downslope flow produces an oscillation of the drainage front from 5-8 km offshore to 10 km inland.

DTIC

Data Bases; Data Processing; Upstream; Wind (Meteorology)

19970019698 Florida State Univ., Dept. of Meteorology, Tallahassee, FL USA

Impact of Enso on Weather Conditions at Continental USA Military Bases

Sweeny, Shannon R., Florida State Univ., USA; Dec. 09, 1996; 105p; In English

Report No.(s): AD-A319128; AFIT-96-085; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The climatic response to El Nino Southern Oscillation (ENSO) events is assessed at continental U.S. military bases for fog, Instrument Flight Rule conditions, snow and freezing rain. Forty-five years of monthly data are classified as El Nino (warm phase), El Viejo (cold phase), or Neutral (neither) according to sea surface temperature anomalies in the central equatorial Pacific. The seasonal data are resampled to estimate population distributions for each of 10, three month seasons in an ENSO year. The difference in means between El Nino (El Viejo), and Neutral events are determined. Conditional probabilities (the probability that a three month seasonal mean for El Nino (El Viejo) will exceed the long-term mean plus one standard deviation) are calculated for all 10 seasons for each climate variable. The results indicate that there are fewer occurrences of fog in both El Nino and El Viejo years than Neutral years, with a few exceptions. Given an El Nino year, fewer IFR hours occur across the entire country, however, during El Viejo years more (fewer) IFR hours occur at military bases in the east (west). The frequency of snow during an El Nino year is dependent on location, but during an El Viejo year fewer (more) hours of snow occur in the east (west). Freezing rain events occur so infrequently that the method could only be applied in a few cases. El Viejo years have more freezing rain events than El Nino years, and the mid-West region has the highest probability of freezing rain events during an El Viejo year.

DTIC

Weather Forecasting; Southern Oscillation; Climatology

19970019719 Florida State Univ., Dept. of Meteorology, Tallahassee, FL USA

Numerical Studies of the Georgia Coast Sea Breeze

Tunney, Douglas A., Florida State Univ., USA; Dec. 09, 1996; 185p; In English

Report No.(s): AD-A319135; AFIT-96-083; No Copyright; Avail: CASI; A09, Hardcopy; A02, microfiche

This study presents a numerical examination of the land and sea breeze system (LSBS) that develops in the Wassaw Sound, located southeast of Savannah, Georgia and site of the 1996 Summer Olympic Games sailing competition. The project used the Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model version 5 to simulate the diurnal circulations that evolve in the Wassaw Sound under varying flow regimes. Model runs were designed to examine the initiation, development, intensity, duration, and decay of the LSBS, with emphasis on the seaward component of the circulation. Thermodynamic and wind profiles used for model initialization were compiled from 1082 Charleston, South Carolina soundings from 1946 to 1992 for the period 15 July through 15 August. Idealized model runs were conducted with all domains initialized to represent either calm, average, onshore, offshore, or along shore wind profiles developed from the sounding data. Idealized model output showed that under weak forcing, there is a clear transition from the land breeze to the sea breeze and that as the land breeze decays, it migrates seaward as the sea breeze forms at the shoreline.

DTIC

Air Water Interactions; Sea Breeze; Atmospheric Models; Ground Wind; Air Land Interactions; Coasts

19970019897 NASA Marshall Space Flight Center, Huntsville, AL USA

Assessment of Rainfall Estimates Using a Standard Z-R Relationship and the Probability Matching Method Applied to Composite Radar Data in Central Florida

Crosson, William L., Institute for Global Change Research and Education, USA; Duchon, Claude E., Oklahoma Univ., USA; Raghavan, Ravikumar, Institute for Global Change Research and Education, USA; Goodman, Steven J., NASA Marshall Space Flight Center, USA; Journal of Applied Meteorology; Aug. 1996; Volume 35, pp. 1203-1219; In English

Contract(s)/Grant(s): NAS8-37140; SUB93-216; NAG8-922

Report No.(s): NASA-CR-204623; NAS 1.26:204623; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, microfiche

Precipitation estimates from radar systems are a crucial component of many hydrometeorological applications, from flash flood forecasting to regional water budget studies. For analyses on large spatial scales and long timescales, it is frequently necessary to use composite reflectivities from a network of radar systems. Such composite products are useful for regional or national studies, but introduce a set of difficulties not encountered when using single radars. For instance, each contributing radar has its own calibration and scanning characteristics, but radar identification may not be retained in the compositing procedure. As a result, range effects on signal return cannot be taken into account. This paper assesses the accuracy with which composite radar imagery can be used to estimate precipitation in the convective environment of Florida during the summer of 1991. Results using $Z = 300R(\text{sup } 1.4)$ (WSR-88D default Z-R relationship) are compared with those obtained using the probability matching method (PMM). Rainfall derived from the power law Z-R was found to be highly biased (+90%-110%) compared to rain gauge measurements for various temporal and spatial integrations. Application of a 36.5-dBZ reflectivity threshold (determined via the PMM) was found to improve the performance of the power law Z-R, reducing the biases substantially to 20%-33%. Correlations between precipitation estimates obtained with either Z-R relationship and mean gauge values are much higher for areal averages than for point locations. Precipitation estimates from the PMM are an improvement over those obtained using the power law in that biases

and root-mean-square errors are much lower. The minimum timescale for application of the PMM with the composite radar dataset was found to be several days for area-average precipitation. The minimum spatial scale is harder to quantify, although it is concluded that it is less than 350 sq km. Implications relevant to the WSR-88D system are discussed.

Author

Hydrometeorology; Precipitation (Meteorology); Meteorological Radar; Water; Radar Imagery; Probability Theory; Forecasting

19970019936 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

Forecast of Atlantic Seasonal Hurricane Activity for 1997

Gray, William M., Colorado State Univ., USA; Knaff, John A., Colorado State Univ., USA; Landsea, Christopher W., National Oceanic and Atmospheric Administration, USA; Mielke, Paul W., Jr., Colorado State Univ., USA; Berry, Kenneth J., Colorado State Univ., USA; Jun. 06, 1997; 16p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Information obtained through May 1997 indicates that, as during the previous two seasons the 1997 Atlantic hurricane season is again likely to have greater-than-average activity. We project that total season activity will include 11 named storms (average is 9.3), 55 named storm days (average 47), 7 hurricanes (average 5-8), 25 hurricane days (average 24), 3 intense (category 3-4-5) hurricanes (average 2.2), 5 intense hurricane days (average is 4.7) and a hurricane destruction potential (HDP) of 75 (average 71). Whereas net 1997 tropical cyclone activity is expected to be 110 percent of the long term average, this year's activity should be appreciably less than the unusually active 1995 and 1996 seasons. Still, 1997 should be significantly more active than the average of the generally suppressed hurricane seasons during the last 25 years and especially in comparison to the particularly quiet seasons of 1991-1994. This early June updated forecast is the same as projected in our early December (1996) and early April 1997 forecasts. An important element entering this updated forecast is the belief that the recently formed warm ENSO event will not overly disrupt this year's Atlantic activity. If this 1997 hurricane forecast is approximately correct, then the 3-year period of 1995-1997 will have been the most active consecutive three years of hurricane activity on record. This suggests that we are entering a new era of generally greater Atlantic basin hurricane activity. A final updated forecast for 1997 will be issued on 6 August 1997. A verification of this year's forecast will be made in late November 1997.

Author

Hurricanes; Atlantic Ocean; Weather Forecasting

19970020079 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

Temperature Data Continuity with the Automated Surface Observing System

Schrumpf, Alison D., Colorado State Univ., USA; Jan. 09, 1997; 256p; In English

Report No.(s): AD-A320370; AFIT-96-111; No Copyright; Avail: CASI; A12, Hardcopy; A03, microfiche

The National Weather Service has been installing Automated Surface Observing Systems (ASOS) at all first-order weather stations since 1991 as a part of their modernization program. The introduction of this new, automated method of observing the atmosphere has brought with it inherent differences in measuring surface meteorological conditions. One such affected variable is surface air temperature. When ASOS temperature readings at various weather stations were compared to simultaneous temperature readings reported by the Model HO83 instrument, which is used in conventional, man-made observations at those stations, discrepancies were often noted. These discrepancies lead to inevitable inhomogeneity in the temperature time series at stations where ASOS is installed. This investigation examines the sources contributing to these temperature differences for each of the 76 stations in this study. Examination of temperature differences between conventional observations (using the Model HO83 and designated as CONV for this study) and pre-commissioned ASOS observations have shown conventional observations are warmer (for a large majority of stations) than the corresponding ASOS temperature measurements. Comparing all synoptic hours for all seasons, the average ASOS - CONV temperature differences ranged from -2.56 deg F (ATL) to +0.61 deg F (ORH), with a mean value of -0.79 deg F.

DTIC

Atmospheric Temperature; Time Series Analysis; Weather Stations; Temperature Measurement; Annual Variations

19970020220 Science and Technology Corp., Hampton, VA USA

CHANCES Layered Cloud (CLVL) Product: Initial 1-Month Sample Final Report, 29 Sep. 1995 - 31 Jul. 1996

Forsythe, John M., Science and Technology Corp., USA; Chaapel, Charles A., Science and Technology Corp., USA; Ringerud, Mark A., Science and Technology Corp., USA; Jul. 1996; 42p; In English

Contract(s)/Grant(s): DAAH 04-95-I-0661

Report No.(s): AD-A316790; STC-TR-3108; ARO-34980.1-GS; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Climatological and Historical Analysis of Clouds for Environmental Simulations (CHANCES) database was used, with additional supportive data, to produce a multi-layer cloud database for an initial 30-day period in July, 1994 (selected from within the CHANCES database period of February 1994 through January 1995 inclusive). The supportive data include the USAF High-Resolution Analysis System (HIRAS) and Surface Temperature data, USAF ECCO surface observations (DATSAV2 database), DMSP Special Sensor Microwave Imager (SSM/I) retrievals, and the U.S. Navy topographic database (ETOPOS). The global satellite image data set that served as the primary input to this layered cloud product is the CHANCES image database. The CHANCES database was built for the USAF Phillips Laboratory by Science and Technology Corporation-METSAT Division (STC-METSAT) under an SBIR Phase 2 Contract No. F19628-93-C-0197. In the present study, the 5-km resolution CHANCES infrared image database was the primary satellite radiance input for the location of clouds. The HIRAS analysis and satellite microwave retrievals (e.g., SSM/I) were used to provide the vertical moisture distribution for the cloud layer assignments. The surface observations were used as input for both cloud base measurements and estimates. Surface observations were the primary input source over land, and the HIRAS analysis and SSM/I retrievals were the primary data source over the oceans.

DTIC

Cloud Cover; Climatology; Satellite Imagery; Remote Sensing; Infrared Imagery; Microwave Imagery

19970020227 Naval Postgraduate School, Dept. of Meteorology, Monterey, CA USA

Boundary Layer Effects on Frontal Interaction with Topography

Powell, John H., Naval Postgraduate School, USA; Jun. 1996; 75p; In English

Report No.(s): AD-A316800; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

A hydrostatic, primitive equation model with frontogenetical deformation forcing is used to simulate the passage of cold fronts over a two-dimensional ridge. The model includes a K-theory planetary boundary layer (PBL) parameterization with implicitly defined diffusion coefficients. Numerical simulations are performed for synoptic-scale ridges of varying widths both with and without frontal forcing. These results are compared to simulations that do not include a PBL parameterization, similar to previous inviscid studies by Williams et al. Relative to the inviscid results, the PBL simulations produced reduced frontolysis on the upwind slope and reduced frontogenesis on the lee slope, resulting in significantly smaller frontogenetic variations over the mountain. This is caused by convergence forcing in the well-mixed layer offsetting the overall frontolytical forcing on the upwind slope, and greatly reduced lee side convergence forcing due to the PBL. In contrast to the inviscid results, the final downstream front is weaker in the mountain simulations than in the flat-topography control case when PBL effects are included. In all PBL simulations, gravity wave generation is greatly reduced and no lee side hydraulic jumps are observed. In general, the inclusion of a PBL into the model results in more realistic wind and temperature fields compared to the inviscid model simulations.

DTIC

Cold Fronts; Mathematical Models; Boundary Layer Flow; Air Flow; Planetary Boundary Layer; Flow Distribution; Topography

19970020307 Utah Univ., Dept. of Meteorology, Salt Lake City, UT USA

Utah Local Area Model Sensitivity to Boundary Conditions for Summer Rain Simulations

DeSordi, Steven P., Utah Univ., USA; Aug. 1996; 122p; In English

Report No.(s): AD-A319136; AFIT-96-084; No Copyright; Avail: CASI; A06, Hardcopy; A02, microfiche

The Utah Limited Area Model is integrated over a period of approximately 2 weeks during the summer floods that occurred in 1993 over the Upper Mississippi River Basin. The central goal is to determine the sensitivity of the simulated precipitation pattern to the method of specifying the upper and lateral boundary conditions. Three different upper boundary conditions are tested. The first does not allow feedback from the local model upon the pressure field at the model top. The second includes a modification of this field suggested by Klemp and Durran (1983) to allow vertical propagation of gravity waves through the model top. The third tested upper boundary condition specifies a pressure modification designed to eliminate w at the model top, as proposed by Innocentini et al. (1993). Model forecasts using the first two boundary conditions overpredict rainfall over Iowa, whereas the third simulation underpredicts the rainfall here and in most other regions. All simulations are poor with regard to heavy rain that was underpredicted southwest of Iowa where the NCEP reanalysis rainfall is relatively superior. Some of the limited area simulations are relatively better in the southeast portion of the country, where they provide more realistic rainfall structure than does the NCEP reanalysis. The limited area model predictions are also rather sensitive to the model used for boundary conditions. Boundary conditions interpolated from NGM model analyses and 6-h forecasts produce significantly more realistic regional Utah Limited Area Model simulations than boundary conditions interpolated from the NCEP reanalysis. There is relatively less sensitivity to the spec-

tral relaxation of limited area forecasts to outer model results, although this did generate rainfall in some regions that were excessively dry.

DTIC

Weather Forecasting; Rain; Atmospheric Models; Floods

19970020331 Texas A&M Univ., Dept. of Meteorology, College Station, TX USA

A Lightning Summary and Decision Model for Thunderstorm Prediction at Whiteman Air Force Base, Missouri

Bass, Randall G., Texas A&M Univ., USA; Dec. 10, 1996; 154p; In English

Report No.(s): AD-A319138; AFIT-96-094; No Copyright; Avail: CASI; A08, Hardcopy; A02, microfiche

A cloud-to-ground lightning summary was developed for a 139x185 kilometer area centered at Whiteman Air Force Base. Spatial and temporal patterns, and first stroke peak currents were analyzed from 1989-1995. Stability indices were examined for thunderstorm and non-thunderstorm periods on a seasonal basis. Regression equations developed using these variables distinguished thunderstorm periods from non-thunderstorm periods. Decision models were presented that combined responses from the equations with other meteorological considerations. A preferred track for springtime thunderstorms was located between the base and the Ozark Mountains. No preferred track was found during the other seasons. Although diurnal distributions of lightning flashes showed that thunderstorms were possible at any time, late afternoon and nocturnal maxima were observed during the spring and summer. The nocturnal maximum disappeared during the fall. First flash times for thunderstorm events were spread out for the spring and fall. A summertime peak between 1800-2100 UTC (1200-1 500 CST) was detected. Last flash times tended to be random, but preferences were observed for early evening and early morning. The percentage of positive flashes nearly doubled in 1994 and 1995 compared to previous years. An increase was observed in the number of positive flashes with peak currents below 60 kA. An increase of negative flashes with peak currents below 20 kA was seen, but contamination by intracloud flashes could not be disregarded. The four spring and fall regression equations for thunderstorm prediction performed better than the two for summer. When tested on independent data, one spring equation had a critical success index (CSI) of 59% and probability of detection (POD) of 100%. One summer equation had a CSI of 55% and POD of 85%. Two thunderstorm decision models were constructed using the seasonal

DTIC

Thunderstorms; Mathematical Models; Weather Forecasting; Airports; Diurnal Variations; Lightning; Aviation Meteorology

19970020343 Finnish Meteorological Inst., Helsinki, Finland

Geophysical publications: Lightning Observations in Finland, 1996, No. 42 *Geofysikaalisia Julkaisuja: Salamahavainnot 1996, No. 42*

Tuomi, Tapio J., Finnish Meteorological Inst., Finland; 1996; ISSN 0782-6087; 36p; In Finnish; In English

Report No.(s): FMI-LO-42; ISBN-951-697-452-X; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

The Finnish Meteorological Institute has collected and published lightning flash counter results since 1960. In 1996 the counter network consisted of seven stations in northern Finland (Lapland). An automatic lightning location system set up in 1984 has four direction finders and covers the southern half of Finland up to southern Lapland. The central unit of the location system was replaced by a microcomputer in 1995. Lightning activity in summer 1996 was the lowest in the statistics collected since 1960. This was due to the cold early summer and dry late summer. The most active month, July, reached only half the average in the number of flashes. The most active thunder day was July 9 with about 2000 located flashes within the Finnish borders. The location system detected slightly over 6000 flashes within the country during the whole summer, which corresponds to almost 14,000 true cloud-to-ground flashes in the southern half of Finland. The fraction of located to true flashes reflects the detection efficiency of a system of three direction finders, because the fourth direction finder suffered from communication failures.

Author

Lightning; Finland; Annual Variations

19970020357 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Seasonal Variations of Water Vapor in the Lower Stratosphere Inferred from ATMOS/ATLAS-3 Measurements of H₂O and CH₄

Abbas, M. M., NASA Marshall Space Flight Center, USA; Michelsen, H. A., Harvard Univ., USA; Gunson, M. R., Jet Propulsion Lab., California Inst. of Tech., USA; Abrams, M. C., Science Applications International Corp., USA; Newchurch, M. J., Alabama Univ., USA; Salawitch, R. J., Jet Propulsion Lab., California Inst. of Tech., USA; Chang, A. Y., Jet Propulsion Lab., California Inst. of Tech., USA; Goldman, A., Denver Univ., USA; Irion, F. W., California Inst. of Tech., USA; Manney, G. L., Jet Propulsion Lab., California Inst. of Tech., USA; Moyer, E. J., Jet Propulsion Lab., California Inst. of Tech., USA; Nagaraju, R., Alabama Univ., USA; Rinsland, C. P., Science Applications International Corp., USA; Stiller, G. P., Forschungszentrum Karlsruhe

G.m.b.H., Germany; Zander, R., Liege Univ., Belgium; Geophysical Research Letters; Aug. 15, 1996; ISSN 0094-8534; Vol. 23, No. 17, pp. 2401-2404; In English

Contract(s)/Grant(s): NAS7-100

Report No.(s): NASA-CR-204620; NAS 1.26:204620; Paper 96GL-01321; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

Stratospheric measurements of H₂O and CH₄ by the Atmospheric Trace Molecule Spectroscopy (ATMOS) Fourier transform spectrometer on the ATLAS-3 shuttle flight in November 1994 have been examined to investigate the altitude and geographic variability of H₂O and the quantity $H = (H_2O + 2CH_4)$ in the tropics and at mid-latitudes (8 to 49 deg N) in the northern hemisphere. The measurements indicate an average value of 7.24 +/- 0.44 ppmv for H between altitudes of about 18 to 35 km, corresponding to an annual average water vapor mixing ratio of 3.85 +/- 0.29 ppmv entering the stratosphere. The H₂O vertical distribution in the tropics exhibits a wave-like structure in the 16- to 25-km altitude range, suggestive of seasonal variations in the water vapor transported from the troposphere to the stratosphere. The hygropause appears to be nearly coincident with the tropopause at the time of observations. This is consistent with the phase of the seasonal cycle of H₂O in the lower stratosphere, since the ATMOS observations were made in November when the H₂O content of air injected into the stratosphere from the troposphere is decreasing from its seasonal peak in July-August.

Author

Methane; Northern Hemisphere; Stratosphere; Water Vapor

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OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19970019316 Columbia Univ., New York, NY USA

Ice Vibrations on the Arctic Channel Final Report, 1 Jan. 1987 - 31 Dec. 1988

Kutschale, H., Columbia Univ., USA; Mar. 1996; 39p; In English

Contract(s)/Grant(s): N00014-87-K-0274

Report No.(s): AD-A317278; 5-21644; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Differences in signal-to-noise ratios between hydrophones and geophones were measured as a function of signal grazing angle with level ice and signal frequency. The frequency distributions in the differences clearly show two groupings. One group represents waves traveling in the Arctic sound channel with grazing angles less than 20 degrees and the other group represents waves with large grazing angles beyond 70 degrees such as long-range mantle P and S waves created by earthquakes and explosions. In the band 8 Hz to 20 Hz in SOFAR signals, T-phases, and topographic echoes the hydrophones at depths near 40 m in the water of the channel record waves about 7 dB stronger in average signal-to-noise ratio compared to vertical geophones on the ice. At large grazing angles near 75 degrees the relative performance between the two sensors reverses, with the average signal-to-noise ratio recorded by the vertical geophones about 3 dB better compared to that recorded by the hydrophones.

DTIC

Hydrophones; Arctic Regions; Topography; Signal to Noise Ratios; Ice; Seismology; Vibration; Earthquakes

19970019388 Woods Hole Oceanographic Inst., MA USA

Spectral Parameterization of Sound Wave Scattering from a Random Ocean Bottom and Acoustic Reconnaissance Data Analysis Final Report

Frisk, George V., Woods Hole Oceanographic Inst., USA; Tang, Dajun, Woods Hole Oceanographic Inst., USA; May 06, 1996; 4p; In English

Contract(s)/Grant(s): N00014-92-J-1432

Report No.(s): AD-A317399; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

The objectives of the grant was to develop a new concept called the Scattering Correlation Coefficient (SCC) to characterize low-frequency bottom scattering and to analyze some of the 1991 ARSRP reconnaissance experiment data obtained in the sediment pond. In the data analysis part of our work, we concentrated on understanding the data set near a sediment pond area. Because the environment surrounding this pond was very complicated, and the acoustic source/receiver array responses have complicated structures, we proceeded by isolating individual effects and comparing the scattered signals due to the sediment with those due to rocky areas at exactly the same incident and scattering angles. We accomplished this by using forward- and backward-looking beam signals with the same beam angles. Pings 198 and 199 from the ARSRP 1991 reconnaissance cruise were extensively ex-

aminated. For the modeling part, we have introduced a spectral parameterization which is suitable for describing acoustic scattering from a random ocean bottom.

DTIC

Acoustic Scattering; Wave Scattering; Ocean Bottom; Sound Waves; Underwater Acoustics

19970019498 Woods Hole Oceanographic Inst., MA USA

Spectral Characteristics of the Marine Surface Layer Final Report

Edson, James B., Woods Hole Oceanographic Inst., USA; May 22, 1996; 5p; In English

Contract(s)/Grant(s): N00014-93-I-0274

Report No.(s): AD-A317303; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

The goal of this research is to gain a better understanding of the processes affecting the near-surface flow in marine surface layer. The first objective is to improve our understanding of flux profile relationships over the ocean using our mean and flux measurements and the TKE budget equation. This has involved an investigation of the applicability of similarity theory to over-ocean measurement in order to determine these functions and their proportionality factors. The result of this investigation have shown that the turbulence statistics are similar to those computed over land as long as one is well above the wave boundary layer (WBL). The second objective is to gain a better understanding of the role that stress/wave interaction plays in these processes. The measurement of these profiles in both shallow water and open-ocean settings is allowing us to develop dimensionless functions that are valid anywhere in the constant flux layer. The results of this research that the behavior of the turbulence in the WBL is strongly affected by the wave induced flow. The height of the WBL can be a substantial portion of the surface layer depending on the wave state.

DTIC

Surface Layers; Marine Environments; Turbulence; Boundary Layers; Air Water Interactions; Water Waves

19970019507 Harvard Univ., Div. of Engineering and Applied Sciences, Cambridge, MA USA

Coastal Scene Description in the Middle Atlantic Bight: Data Analysis, Feature Models and Data Fusion Final Report, from 1 Sep. 1994 - 25 Apr. 1996

Robinson, Allan R., Harvard Univ., USA; Apr. 1996; 8p; In English

Contract(s)/Grant(s): N00014-94-I-G915

Report No.(s): AD-A317142; NRL-CR/7320-96-0001; No Copyright; Avail: CASI; A02, Hardcopy; A01, microfiche

This Final Technical Report covers the research and work carried out from October 1994 to April 1996. The work here described formed part of the Coastal (Tactical) Oceanographic Program in coordination and collaboration with Rutgers University (Dr. Scott Glenn), JHU/APL (Drs. Lee Dantzler and David Scheer) and APL/UW (Dr. Robert Miyamoto). The work focused on: 1) scientific and technical issues related to the construction of environmental fields useful for coastal scene description via fusion of data streams and models; 2) demonstration of the approach in a real time nowcast forecast exercise (Harvard/Saclant) in the Straits of Sicily (ALS94); and, 3) application of the methodology to the Mid-Atlantic Bight shelf and shelf-slope region.

DTIC

Coasts; Atlantic Ocean; Data Flow Analysis; Environment Models

19970019537 Rhode Island Univ., Graduate School of Oceanography, Narragansett, RI USA

RAFOS Float Data Report of the North Atlantic Current Study 1993 - 1995, Jul. 1993 - Jun. 1995

Anderson-Fontana, Sandra, Rhode Island Univ., USA; Prater, Mark, Rhode Island Univ., USA; Rossby, H. Thomas, Rhode Island Univ., USA; Sep. 1996; 246p; In English

Contract(s)/Grant(s): N00014-92-J-1651

Report No.(s): AD-A317147; GSO-TR-96-4; No Copyright; Avail: CASI; A11, Hardcopy; A03, microfiche

This report is a summary of all RAFOS float data collected during the 1993-1995 study of the North Atlantic Current (NAC) and adjacent waters in the Newfoundland Basin. The objective of the program was to study the structure of the currents in the NAC region and the exchange of waters between the subtropical and subpolar gyres in the Newfoundland Basin. One hundred floats were deployed during three separate cruises in Summer 1993, Fall 1993, and Fall 1994. The floats were ballasted for a density surface corresponding to $\sigma_t = 27.2$ or 27.5 . They were designed to cycle once or twice a day to surfaces 0.1 σ_t units above and below the targeted density surface in order to determine changes in stratification and temperature along the trajectories. Most float missions had a duration of ten months. The floats were tracked using four moored sound sources deployed in the Newfound-

land Basin during the first cruise, and recovered in June 1995. We present the trajectories, velocity time series, and pressure and temperature time series for all floats that could be processed. Of the 100 RAFOS floats deployed, all but eight returned useful data.

DTIC

Hydrodynamics; Ocean Currents; Atlantic Ocean; Floats

19970019608 Naval Postgraduate School, Monterey, CA USA

Coherent Acoustic Sediment Flux Probe *Final Report*

Stanton, T. P., Naval Postgraduate School, USA; Sep. 1996; 74p; In English

Report No.(s): AD-A317171; CERC-96-1; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

A high resolution, three component sediment flux probe has been developed to meet the objectives outlined by the National Academy of Science Panel on Coastal Engineering Measurements using very high-frequency coherent acoustic doppler techniques. The Coherent Acoustic Sediment Flux Probe (CASP) system consists of an underwater housing equipped with three 5.2-MHz acoustic transceivers, a single 1.4 MHz transceiver, a pair of precision tilt sensors to correct package orientation tilts, and electronic processing and control modules which output a high speed digital data stream to a shore based processing computer. The instrument package is typically positioned looking downward at the bottom boundary layer to sample the velocity vector and sediment flux vector at a primary measurement volume 25 cm in front of the instrument head. In addition, profiles of sediment concentration are estimated every 1.68 cm along each of the four narrow acoustic beams. Suspended sediment concentrations are inferred from profiles of acoustic backscatter acoustic intensity by measuring the range gated power returns from the 1.3-MHz transceiver and each of the 5.2-MHz transceivers. The backscatter power levels are converted to sediment concentration profiles using an acoustic model which includes the effects of attenuation due to water and suspended mass, and radial spreading, to produce profiles from 6 cm in front of the instrument head to the sediment bed, up to a range of 1.2 m. Under restricted conditions, the ratio of backscatter measured by the 1- and 5-MHz transceivers can be used to identify changes in the mean sediment size.

DTIC

Acoustic Emission; Data Flow Analysis; Transmitter Receivers

19970019714 Delaware Univ., Ocean Engineering Lab., Newark, DE USA

Formulation and Validation of Vertically Two-Dimensional Shallow-Water Wave Model

Johnson, Bradley D., Delaware Univ., USA; Kobayashi, Nobuhisa, Delaware Univ., USA; Cox, Daniel T., Delaware Univ., USA; Jul. 1996; 137p; In English

Contract(s)/Grant(s): DAAL03-92-G-0116

Report No.(s): AD-A316818; CACR-96-05; ARO-30379.45-GS-URI; No Copyright; Avail: CASI; A07, Hardcopy; A02, microfiche

The computer program VBREAK is developed to predict the time-dependent, two-dimensional velocity field under normally incident breaking waves on beaches and coastal structures. To reduce computation time considerably, use is made of the depth-integrated continuity and horizontal momentum equations. The momentum equation includes the momentum flux correction due to the vertical variation of the horizontal velocity. The bottom shear stress is expressed in terms of the near-bottom horizontal velocity immediately outside the thin wave boundary layer. The third equation for the momentum flux correction is derived from the depth-integrated wave energy equation. In order to express these three one-dimensional, time-dependent equations in terms of the three unknown variables of the water depth, depth-averaged horizontal velocity, and near-bottom horizontal velocity, the normalized vertical profile of the horizontal velocity is assumed to be cubic on the analogy between turbulent bores and hydraulic jumps. Furthermore, the turbulent shear stress is assumed to be expressed using the turbulent eddy viscosity whose mixing length is proportional to the water depth.

DTIC

Water Waves; Wave Equations; Two Dimensional Models; Shear Stress; Shallow Water; Mixing Length Flow Theory; Eddy Viscosity; Continuity Equation

19970019718 Woods Hole Oceanographic Inst., MA USA

Numerical Studies of Flow Past Isolated Seamounts *Final Report, 1 Oct. 1988 - 31 Aug. 1996*

Chapman, David C., Woods Hole Oceanographic Inst., USA; Haidvogel, Dale B., Rutgers Univ., USA; Dec. 05, 1996; 3p; In English

Contract(s)/Grant(s): N00014-89-J-1106

Report No.(s): AD-A319130; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

Our long-range goal was to understand the influence of tall and/or steep topographic features on the ocean circulation. of particular interest was the occurrence of systematic processes such as upwelling, mixing, eddy shedding, mean flow generation,

and the trapping of energy and/or water parcels in the neighborhood of such features. Our approach was to use a sigma-coordinate primitive-equation numerical model to explore the flow past a tall isolated seamount under a variety of conditions, and with varying degrees of realism. We began with several idealized studies of flow past a tall isolated seamount. A number of technical issues were explored in order to better understand the model performance and limitations, as well as to provide insight into model improvements (Beckmann and Haidvogel, 1993). We studied eddy shedding and the formation of regions of trapped fluid, called Taylor caps, resulting from steady flow past a tall, Gaussian-shaped seamount in a stratified ocean (Chapman and Haidvogel, 1992). We quantified the occurrence of Taylor caps for various inflow speeds and seamount heights. We then investigated the generation of internal lee waves over this same idealized seamount, showing that these lee waves result from the local nonlinear acceleration of flow around the seamount, and that they may be important for local mixing (Chapman and Haidvogel, 1993). We also studied the excitation of seamount-trapped waves caused by weak ambient tidal oscillations (Haidvogel et al., 1993). This work confirmed the amplification of these waves under certain conditions and showed that a rectified mean anti-cyclonic flow is generated as well, consistent with observations near Fieberling Guyot. Finally, we explored the combined effects of weak oscillatory tides and steady inflow, and found that the response is basically the superposition of the two separate responses.

DTIC

Mathematical Models; Ocean Currents; Seamounts; Steady Flow

19970019891 Woods Hole Oceanographic Inst., MA USA

Implications of Fine-Scale Magnetism for the Structure and Evolution of Slowly Accreted Oceanic Crust *Final Report, 1 Feb. 1994 - 31 May 1996*

Tivey, Maurice A., Woods Hole Oceanographic Inst., USA; Jan. 02, 1997; 4p; In English

Contract(s)/Grant(s): N00014-94-I-0467

Report No.(s): AD-A319279; WHOI-13046700; No Copyright; Avail: CASI; A01, Hardcopy; A01, microfiche

The long range objective of this program is to understand the structure of oceanic crust created at slow-spreading ridges by investigating the patterns of magnetization that reside in the crust. The project seeks to investigate how crustal magnetic fields are related to the structural deformation history of oceanic crust formed in slow spreading environments and how magnetization may be used to predict the properties of the underlying crust. Scientific Objectives are: (1) Investigate the relationship between crustal magnetization and the tectonic structure and architecture of oceanic crust by comparing the magnetization patterns of crust created at 'inside corners' versus 'outside corners' of ridge segment offsets. (2) Investigate the relationship between crustal magnetization and cyclic magmatic and tectonic processes involved in crustal formation and how this magnetization signal varies with age. (3) Investigate along-axis variability in crustal magnetization within a ridge segment and compare with the ridge axis signal. (4) Map magnetic isochrons to provide temporal framework for other related studies e.g. investigate how crustal structure and seafloor morphology change with spreading rate.

DTIC

Ocean Bottom; Geomagnetism; Earth Crust; Tectonics; Morphology

19970019910 Bolt, Beranek, and Newman, Inc., Arlington, VA USA

Development of a Comprehensive Hydroacoustic Coverage Assessment Model *Final Report, Aug. 1995 - Aug. 1996*

Farrell, Ted, Bolt, Beranek, and Newman, Inc., USA; LePage, Kevin, Bolt, Beranek, and Newman, Inc., USA; Sep. 1996; 76p; In English

Contract(s)/Grant(s): F19628-95-C-0174

Report No.(s): AD-A319829; TM-W1278; PL-TR-96-2248; No Copyright; Avail: CASI; A05, Hardcopy; A01, microfiche

A model for predicting the detection and localization performance of hydroacoustic monitoring networks has been developed. The model accounts for major factors affecting global-scale acoustic propagation in the ocean, such as horizontal refraction from bathymetric features and horizontal changes in sound speed, travel time variability due to spatial and temporal fluctuations in the ocean, and detailed characteristics of the source. In this report, a summary description of the component submodels, environmental databases and output products is provided. Several studies are presented which investigate the sensitivity of the predictions to the component sub-models and/or databases used. Travel time and travel time variance predictions are compared to measured data. Finally, two example applications of the model are described; a prediction of the coverage of the International Monitoring System, and an analysis of the causes of a gap in the predicted coverage.

DTIC

Product Development; Ocean Models; Mathematical Models; Underwater Acoustics

19970019915 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Sea Ice, Part 2, Estimating the Full-Scale Tensile, Flexural, and Compressive Strength of First-Year Ice

Kovacs, Austin, Army Cold Regions Research and Engineering Lab., USA; Sep. 1996; 24p; In English

Report No.(s): AD-A317247; CRREL-96-11-Pt-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, microfiche

Sea-ice salinity, density, and temperature data were used to develop new methods for determining the bulk brine volume and porosity of sea-ice floes. Methods for estimating full-thickness ice sheet strength, based on large-scale field tests, are presented. The relationships among bulk sea-ice properties, strain rate, and strength are illustrated. A new constitutive equation was developed for predicting the full-thickness horizontal compressive strength of first-year sea ice as a function of the applied strain rate and bulk porosity. An estimate of the horizontal force that may develop between first-year sea ice and a 90-m-wide structure is given. Estimating sea-ice strength based on remote ice conductivity measurements is also discussed conceptually.

DTIC

Sea Ice; Thickness; Ice Floes; Brines; Remote Sensing

19970020061 Department of the Navy, Washington, DC USA

Method and Apparatus for Performing Mutations in a Genetic Algorithm-Based Underwater Target Tracking System

Ferkinhoff, David J., Inventor, Department of the Navy, USA; Baylog, John G., Inventor, Department of the Navy, USA; Nov. 12, 1996; 28p; In English

Patent Info.: Filed 12 Nov. 1996; US-Patent-Appl-SN-747469

Report No.(s): AD-D018405; No Copyright; Avail: Issuing Activity (Dept. of the Navy, Washington, DC), microfiche

The invention described herein may be manufactured and used by or for the Government of the USA of America for governmental purposes without the payment of royalties thereon or there for. (1) Field of the Invention The invention relates to sensor-based and genetic algorithm-based underwater target tracking systems and is directed more particularly to a method and apparatus for performing mutations within a genetic algorithm for estimating contact state variables, which method requires less computation time than prior art methods. (2) Description of the Prior Art Detection of a moving object, such as a target, and determination of its range, bearing, speed and course in an ocean environment is a difficult task, particularly if the target is moving relatively noiselessly, and it is desired to perform the detection as early as possible.

DTIC

Tracking (Position); Targets; Underwater Structures

19970020330 Mississippi State Univ., Center for Air Sea Technology, Bay Saint Louis, MS USA

Demonstration of a Real Time Capability to Produce Tidal Heights and Currents for Naval Operational Use: A Cast Study for the West Coast of Africa (Liberia)

Mehra, Avichal, Mississippi State Univ., USA; Anantharaj, Valentine, Mississippi State Univ., USA; Payne, Steve, Mississippi State Univ., USA; Kantha, Lakshmi, Colorado Univ., USA; May 24, 1996; 54p; In English

Contract(s)/Grant(s): NAS13-564

Report No.(s): NASA-CR-203501; NAS 1.26:203501; AD-A310368; CAST-TN-96-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, microfiche

This report documents an existing capability to produce operationally relevant products on sea level and currents from a tides/storm surge model for any coastal region around the world within 48 hours from the time of the request. The model is ready for transition to the Naval Oceanographic Office (NAVOCEANO) for potential contingency use anywhere around the world. A recent application to naval operations offshore Liberia illustrates this. Mississippi State University, in collaboration with the University of Colorado and NAVOCEANO, successfully deployed the Colorado University Rapidly Relocatable Nestable Tides and Storm Surge (CURREnTSS) model that predicts sea surface height, tidal currents and storm surge, and provided operational products on tidal sea level and currents in the littoral region off south-western coast of Africa. This report summarizes the results of this collaborative effort in an actual contingency use of the relocatable model, summarizes the lessons learned, and provides recommendations for further evaluation and transition of this modeling capability to operational use.

DTIC

Real Time Operation; Computerized Simulation; Oceanography; Tides; Military Operations; Production Engineering